THE DENTAL PRACTITIONER

AND DENTAL RECORD

Including the official reports of the British Society of Periodontology, the British Society for the Study of Orthodontics, the European Orthodontic Society, the Glasgow Odontological Society, the Liverpool and District Odontological Society, the North Staffordshire Society of Dental Surgeons, the Odonto-chirurgical Society of Scotland, and the Dental and Medical Society for the Study of Hypnosis

VOL. VIII, No. 10 June, 1958

Monthly 3s. 6d. post 5d. JOHN WRIGHT & SONS LTD. BATH ROAD, BRISTOL 4 Annually £2 2s. post free

SOLE AGENTS: *Australia*: Robertson & Mullens Ltd., Melbourne; *Canada*: The Macmillan Co. of Canada Ltd., Toronto; *New Zealand*: N. M. Peryer Ltd., Christchurch; *Denmark*: Einar Munksgaard, Copenhagen; *Norway*: Olaf Norli, Oslo; *Sweden*: Gumperts Aktiebolag, Göteborg; *South Africa*: P. B. Mayer, Cape Town.

THE DENTAL PRACTITIONER
AND DENTAL RECORD

Vol. VIII, *No.* 10 — *June*, 1958

CONTENTS

EDITORIAL NOTICES

CONTRIBUTIONS should be sent to the Editor, *The Dental Practitioner and Dental Record*, The Stonebridge Press, Bath Road, Bristol 4, or, if preferred, to any member of the Editorial Committee. Original articles are accepted on the understanding that they are contributed solely to this Journal.

Manuscript should preferably be typewritten with double spacing and wide margins, and the author should keep a copy. Articles and their illustrations become the property of *The Dental Practitioner and Dental Record*, unless authors reserve the right before publication.

Illustrations should be clearly numbered and legends should be written on a separate sheet of paper and not put on the backs of the originals. Each figure should be referred to in the text. Prints are preferred to X-ray negatives and should be on glossy paper. Lettering which is to appear on illustrations is best shown on an overlay or rough sketch. It should not be put on the original.

Tables should be typed on separate pages and each should have a caption which will explain the data without reference to the text.

References to dental literature should be recorded in the text, with the name of the author and the year of publication in parentheses. In the bibliography they should be arranged in alphabetical order in the following form, the abbreviations of periodicals being those adopted in the *World List of Scientific Periodicals* (1952), e.g.:—

SMITH, J. A. K. (1949), *Brit. dent. J.*, **86**, 271.

LEWIS, R. W. B. (1947), *The Jaws and Teeth*, 2nd ed., 471. London: Science Publishing Co.

Authors may obtain reprints of their articles if the Publishers are informed when the proofs are returned. They will be charged at the cost of production and 50 copies are suggested as a minimum.

BUSINESS COMMUNICATIONS should be sent to the Publishers, The Stonebridge Press, Bath Road, Bristol, 4.

Back Numbers.—The Publishers would be glad to purchase copies in good condition of Nos. 1 and 5, Vol. I, and No. 3, Vol. V, of *The Dental Practitioner*.

Binding Cases.—Binding cases for Volumes I to VII may be obtained from the Publishers at 5s., post free. They are supplied attractively lettered in imitation gold on a dark red ground. If desired, the Publishers will undertake the binding at an inclusive charge of 16s. 6d.

REPRINTS

Reprints can be supplied at a reduced price if authors will indicate their requirements at the time that proofs are returned. The following scale will be helpful as a guide to the cost; 50 copies are suggested as the minimum number.

PAGES	NUMBER REQUIRED						
	50	100	150	200	250	300	400	500
2	£ 1 0 0	£ 1 5 0	£ 1 10 0	£ 1 14 0	£ 1 17 0	£ 2 0 0	£ 2 5 0	£ 2 10 0
4	1 15 0	2 4 0	2 13 0	3 0 0	3 5 0	3 10 0	3 19 0	4 8 0
6	2 10 0	3 2 6	3 15 0	4 5 0	4 12 6	5 0 0	5 12 6	6 5 0
8	3 0 0	3 15 0	4 10 0	5 2 0	5 11 0	6 0 0	6 15 0	7 10 0
10	3 10 0	4 7 6	5 5 0	5 19 0	6 9 6	7 0 0	7 17 0	8 15 0
12	4 0 0	5 0 0	6 0 0	6 16 0	7 8 0	8 0 0	9 0 0	10 0 0
14	4 10 0	5 12 6	6 15 0	7 13 0	8 6 6	9 0 0	10 2 6	11 5 0
16	5 0 0	6 5 0	7 10 0	8 10 0	9 5 0	10 0 0	11 5 0	12 10 0
Printed Covers	£ 1 12 6	£ 1 17 6	£ 2 2 6	£ 2 7 6	£ 2 12 6	£ 2 17 6	£ 3 7 6	£ 3 17 6

THE DENTAL PRACTITIONER AND DENTAL RECORD

Vol. VIII, No. 10 June, 1958

EDITORIAL

HUMAN UNDERSTANDING

It is well known that every dental surgeon must practise to some degree or other the technique of relaxation, while hypnosis is a stage much farther on and requires to be learnt and practised assiduously. Dental treatment necessitates co-operation and understanding between surgeon and patient if long-term treatment is to be carried out successfully, and from this aspect hypnosis becomes even more important. It is the reaction of a person to certain words and phrases. It becomes essential, then, to have an understanding of the normal human reaction to words. This is a subject which the student knows very little about and the general practitioner can only learn from vast experience. Whether the dental curriculum can be expanded to include a course on psychology and an understanding of the human mind is debatable. However, the need for this knowledge is undoubtedly apparent.

In assessing the dental profession it may be said that it has in the past been firing on only two cylinders. It has slowly climbed the hill on the twin cylinders of mechanics and biology. Since the war it has been running on three, as we now have the increased knowledge and enthusiasm for prevention through public health measures. The fourth cylinder can only be brought into power after a deeper knowledge and appreciation of human understanding in our work. Man's progress through the aeons of time has been towards a process of reasoning and away from biological instinct. In applying the techniques and methods of relaxation or hypnotism both the dentist and the patient must use the power of reasoning that is theirs. If there is to be a satisfactory relationship between operator and patient, it is for the operator to have a good grasp of precisely what he is doing and a knowledge of the effects of his words upon the patient. There is no proof that dental disease is of psychosomatic origin. However, we should realize that our methods of treatment are not only biological and mechanical, but that if the treatment is to have some ultimate good for the patient, the science of both psychosomatics and semantics must be used. It can only be used if it is understood. To progress from the average relaxation techniques employed to the modern use of hypnodontics is a wide and not such an easy step and much more knowledge of this branch is needed.

If dentistry is to progress into the future it will be necessary to train our modern dental surgeons not only in dental surgery and all its aspects, but to train them in the art of human understanding and with a knowledge of the way in which their patients' minds react.

THE EFFECT OF THUMB-SUCKING ON THE DENTITION

By R. G. HENRY, M.D.S.

THE fact that thumb-sucking, tongue-thrusting, and incompetent lip morphology have a somewhat similar effect on the dental arches makes it difficult at times to determine which of these three factors is the most harmful. As they are so frequently found together, it is only natural that one may be blamed for the malocclusion when all three factors may have played a part. The most obvious one is thumb-sucking, especially blamed by the parents of the child suffering from the malocclusion. If, in addition to these three factors, heredity places the dental arches in a skeletal II relationship or deciduous teeth be lost prematurely, or there is a tooth–bone discrepancy, the diagnostic picture is clouded even more.

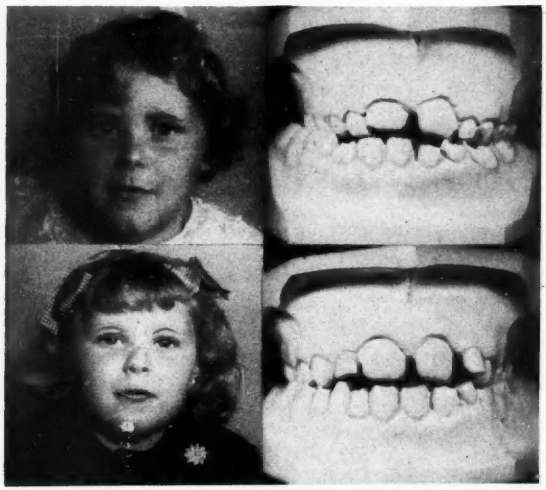


Fig. 1.—Mandibular swing to the right, a result of sucking the left thumb. Expansion of the upper arch corrects this habit reflex.

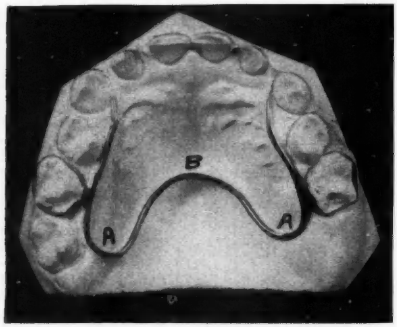


Fig. 2.—The upper lingual appliance expanded before cementation to expand the upper arch.

Thumb-sucking, tongue-thrust swallowing, and incompetent lip morphology tend to produce a Class II labial segment relationship by a proclination of the upper incisors and/or a lingual inclination of the lower incisors.

Generally speaking, the thumb and tongue are the active factors which, in the presence of incompetent lip morphology, skeletal II base relationship, or other contributing factors, will cause or accentuate a Class II labial segment relationship. However, there are occasions when incompetent lips, necessitating a contraction of the mentalis muscle during swallowing, can cause or increase the overjet of a Class II incisor relationship.

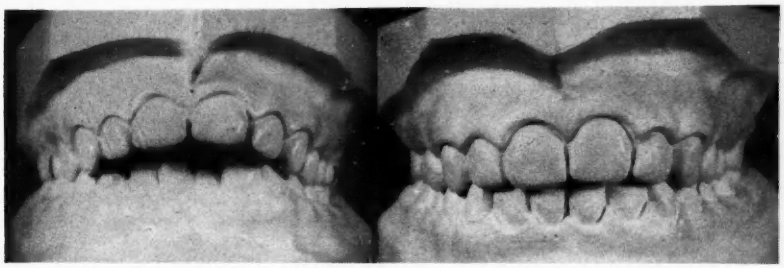


Fig. 3.—Collapse of the lower labial segment corrected after the cessation of the habit.

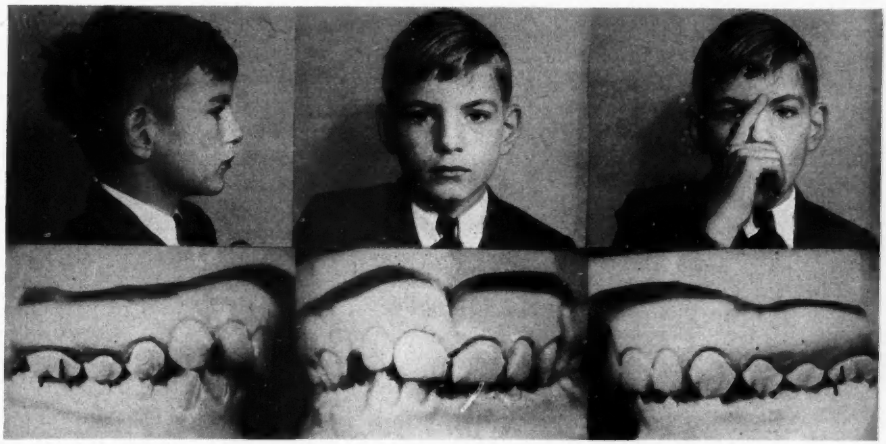


Fig. 4.—Class II, division 1 subdivision with competent lip morphology from thumb-sucking till the age of 11 years.

Fig. 5.—Class II, division 1 subdivision with incompetent lip morphology from thumb-sucking till the age of 12 years.

Some writers seem to deny the fact that thumb-sucking can influence the denture and claim that there must be some other force present to cause the malocclusion. There are,

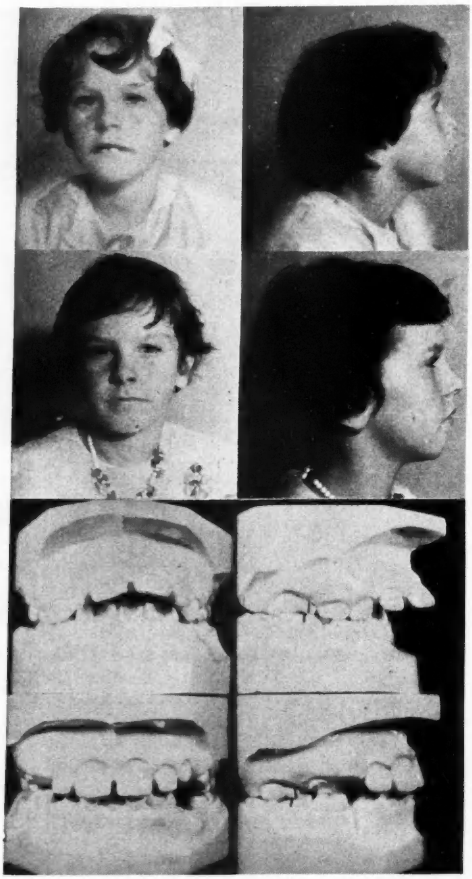


Fig. 6.—Class II labial segment from thumb-sucking associated with the early loss of the deciduous molars. An oral screen worn for 11 months corrected the incisor relationship.

however, certain well-defined types of malocclusion associated with thumb-sucking and it is quite obviously the pressure or presence of the thumb which is primarily to blame.

1. Contraction of the Upper Arch.—The frequent presence of the thumb within the oral cavity prevents the tongue from pressing in its normal position against the roof of the mouth and upper buccal segments, especially during the swallowing process. It also places the buccal musculature at a tension and this tension against the upper buccal teeth is increased by the act of sucking and not balanced by the pressure of the tongue. These factors produce a narrow upper arch which may result in a bilateral crossbite, or, more frequently, an apparent unilateral crossbite (*Fig.* 1).

This unilateral crossbite is a habit reflex caused by the cusp-to-cusp relationship of the buccal segments in centric occlusion. The patient avoids this uncomfortable bite by moving the mandible to one side, usually the one opposite to the side in which the thumb is placed. A patient sucking the left thumb moves the mandible to the right and an apparent crossbite of the right buccal segments results. Accompanying this crossbite is usually some degree of asymmetrical anterior open bite. Once the first molars have erupted and locked into occlusion there is very little chance of self-correction. (*Fig.* 2.)

The forsaking of the thumb-sucking and a slight expansion of the upper arch corrects the malocclusion and the habit reflex disappears.

2. Collapse of the Lower Labial Segment.—Certain cases exhibit a lingual inclination of the lower labial segment at the region where the thumb rests during the sucking process, and, of course, this collapse is frequently to one side, right or left. Where the lip morphology is competent there may be little, if any, effect on the upper incisors, but as the degree of incompetence increases, the greater is the possibility of proclined upper incisors (*Fig.* 3).

As the habit is relinquished, mechanical pressure from an orthodontic appliance aids in the simple correction of the lower arch.

3. Class II, division 1 subdivision.—The high correlation found by the author and others between Class II, division 1 subdivision (Angle) cases is only natural when one considers how readily the upper buccal segment can be moved forward, especially if the habit is continued till after the eruption and occlusion

of the first permanent molars. The Class II side always corresponds with the side on which the pressure is applied, and usually the side in which the thumb is placed.

of the thumb frequently leads to a mesial movement of both buccal segments and a maxillary alveolar protrusion is produced (*Fig.* 6).

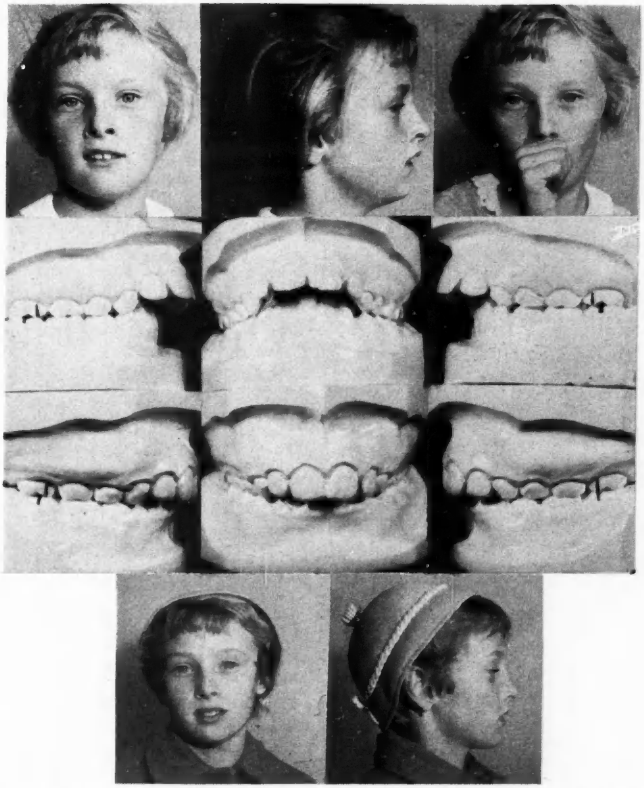


Fig. 7.—Maxillary protrusion produced by 9½ years of thumb-sucking and correction after 12 months of oral screen therapy.

Once again there may be some effect on the labial segments, depending on other associated factors. Where the lips are competent (*Fig.* 4) some infra-occlusion of the teeth can be expected where the thumb is placed. On the other hand, incompetent lip morphology or a slight skeletal II relationship (*Fig.* 5) may be sufficient to permit a proclination of the upper incisor teeth.

4. Maxillary Protrusion.—In the presence of incompetent lip morphology and/or a tendency to skeletal II relationship, prolonged sucking

This may reach quite severe proportions if the habit is continued till the age of 9 or 10, or even later, as is frequently seen in orthodontic practice. It is the author's opinion that it may even affect the whole premaxilla and result in a maxillary basal protrusion (*Fig.* 7).

The prominence of the upper lip in the subnasal region, so noticeable in the original photographs, shows improvement as the habit ceases and the upper arch retracts. *Fig.* 8 shows a marked reduction of this prominence

in a cephalometric tracing where the angle SNA has been reduced 4·5° by pressure on the upper arch only from a cervical strap and double bow arch-wire.

CONCLUSION

It is quite obvious then that there are many factors that may modify or exaggerate the effect of thumb-sucking on the dentition.

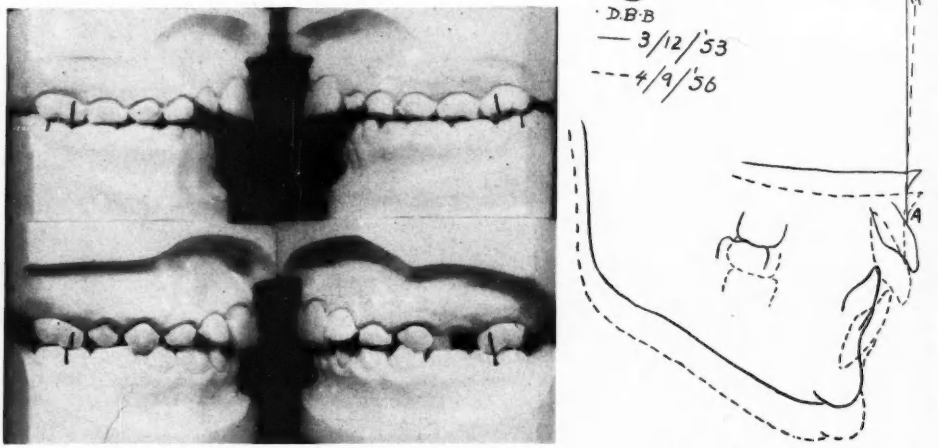


Fig. 8.—Maxillary protrusion corrected by the use of a cervical strap and double bow arch-wire for 30 months.

For this reason, children exhibit different malocclusions from what would appear to be a similar aetiological factor. Yet the habit itself varies with the individual. Some children merely hold the thumb in position; others suck most vigorously. Some discontinue the habit early; others continue till much later. It is a nocturnal habit with some and a frequent and prolonged habit with others.

The other associated factors are recognized, but the high percentage of thumb-sucking associated with Class II labial segment relationship in this country, and rapid and permanent improvement after the discontinuance of the habit and the treatment following, would indicate that thumb-sucking is a definite factor in the aetiology of malocclusion.

Serial Extraction—Procedures and Limitations

Serial extraction implies the removal of selected teeth in an orderly manner over a prolonged period. In authentic discrepancy cases there are three separate stages of treatment: (1) Premature extraction of the deciduous canines; (2) Subsequent extraction of first deciduous molars; (3) Final extraction of the first premolars.

There will be exceptions, of course. Every case must be considered individually. Leave deciduous molars for as long as possible, particularly the second deciduous molars. Premature removal of these teeth means a mesial migration of the first permanent molars and development of a close bite. It is, therefore, essential to be cautious in serial extraction. Its limitations must be recognized. Recommended procedure in the borderline condition is first to attempt ideal treatment without extraction. If extraction appears later to be unavoidable, proceed slowly, removing the teeth in proper sequence and at the proper intervals. Any other course may be prejudicial to the patient.—DEWEL, B. F. (1957), *Amer. J. Orthodont.*, **43**, Sept.

GAS-HEATED VACUUM FURNACE FOR PORCELAIN

By F. F. LYON

Senior Instructor in Dental Mechanics, Dental School, University of St. Andrews

VARIOUS types of furnace for fusing porcelain have been used in dentistry. They were originally heated by burning anthracite, coal, or coke. These furnaces were very large, required a high chimney for draught, and were dirty and most difficult to operate.

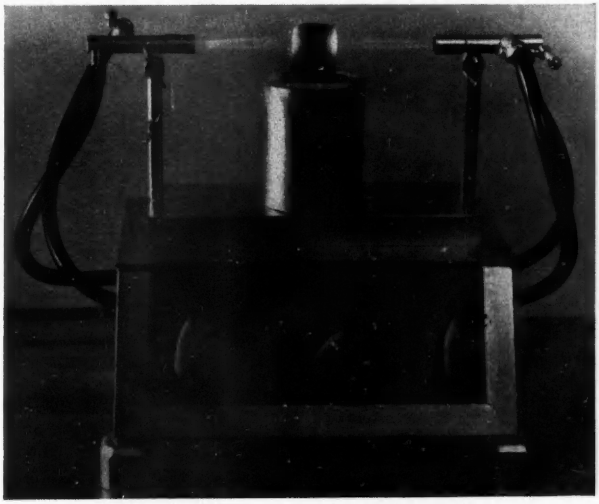


Fig. 1.—Gas-heated vacuum furnace for porcelain.

Dr. Ambler Tees in 1880 (Turner, 1907) produced the first important modification of this type of furnace; he reduced the size and increased its general efficiency.

Gaseous and liquid fuels were later used and great improvements in this field are credited to Dr. C. H. Land in 1886 (Cohen, 1940), A. B. Verrier (1881), and T. Fletcher (1885). The serious fault of these furnaces was the "gassing" of the porcelain, and not until Downie (Cohen, 1940) made a gas-air furnace with a platinum muffle was this danger removed completely.

Dr. L. E. Custer (1898) first demonstrated in 1894 an electric furnace, and within a comparatively short time electric furnaces such as the Hammond, Pelton, and Mitchell were in use.

To-day we have the choice of numerous electric furnaces, the latest types being those in which the porcelain is fused in a partial vacuum. The properties of porcelain fused *in vacuo* are said to be superior to those of the same material fused in air (Klaffenbach, 1955).

The porcelain vacuum furnaces, commercially available, are expensive owing to the difficulties involved in securing airtight seals at relatively high temperatures. Moreover, burning out platinum wire elements adds a not unimportant running cost. Thought was therefore given to the construction of a gas-heated furnace, in which the muffle could be partially evacuated.

The use of heat from a gas-compressed air flame to fuse the porcelain imposes a maximum in the fusion temperature of the porcelain

which is to be used. According to Skinner and Fitzgerald (1938), however, there is little difference in the properties of high- and low-fusing porcelains after fusion. When using this furnace, a porcelain is selected which

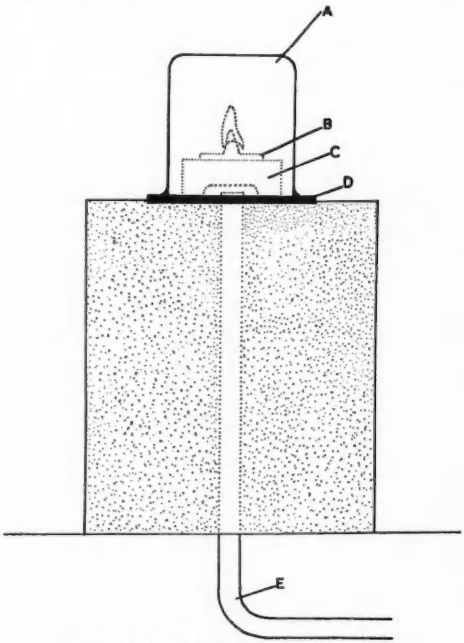


Fig. 2.—A, Muffle; B, Crown Stand; C, Stage; D, Platform; E, Vacuum Tube.

fuses at or near the maximum temperature attainable in the muffle. In the present furnace Vita low-fusing porcelain (980° C.=1796° F.) is suitable. By having a furnace with a limited upper temperature the danger of overfusing is much less than in an electric furnace.

Fig. 1 shows a simple gas-air furnace in which low-fusing porcelain can be fused in partial vacuum.

It comprises a piece of 4-in. U-girder about 1 ft. long, on which are mounted two gas-air blowpipes. In the middle of the girder a 4-in. length of cast-iron tube $3\frac{1}{2}$ in. in diameter (*Fig.* 2) is mounted to support the platform (D) and muffle (A). The platform on which the muffle stands is a piece of sheet stainless steel 2 in. in diameter and $\frac{1}{8}$ in. thick, in the centre of which a hole is drilled to accommodate a length of $\frac{3}{8}$-in. brass tubing (E). This is brazed in position so that the tube projects about $\frac{1}{16}$ in. through the platform.

The space between the cast-iron tube and the platform is filled with an insulating mixture of sand and plaster.

The muffle was cast in the laboratory, using a stellite alloy (Wisil). It is $1\frac{1}{2}$ in. in diameter by $1\frac{3}{4}$ in. high and has walls approximately 0·020 in. thick. The lip of the muffle was thickened to give an edge $\frac{1}{16}$ in. broad.

Fine carborundum paste was used to "grind in" the muffle lip to fit the platform. A good airtight seal must be made, otherwise the necessary degree of vacuum within the muffle cannot be attained.

The girder assembly was mounted on a suitable box to take the tubes and taps necessary for the gas, air, and vacuum connexions. The main gas supply goes through a tap to a T-piece, then to the blowpipes. Similar connexions are made for the air-pressure supply. The vacuum tube is led through a tap to the central tube (E). This tap has an adjustable air intake by which the vacuum may be reduced if necessary. This is essential, as too high a vacuum must be avoided. A negative pressure equivalent to 26 in. of mercury appears to give the best results.

The blowpipes must be adjusted to give maximum heat to the muffle at full gas pressure; a slot in the girder will enable the blowpipes to be moved closer or farther away from the muffle until the best position has been obtained.

The porcelain to be fused should be in the centre of the heated portion of the muffle. A small stage (C) is therefore necessary on which the crown stand may be placed. This stage is made of investment about $\frac{1}{2}$ in. thick and $1\frac{1}{4}$ in. in diameter. The middle of its undersurface is hollowed out and four or five grooves are cut radiating to the outer edge, so that air may be drawn out quite freely by the vacuum pump.

Some graduations are necessary at the air and gas taps and these should be as follows:—

1. A very small flame (only sufficient to dry out the work).
2. Medium heat (dull red).
3. Maximum heat.

The flame is applied to the upper portion of the muffle, so that heat distortion of the muffle lip against the platform is kept to a minimum. Some leakage of air occurs at this point, however, and the vacuum pump used must be capable of maintaining a 26-in. vacuum despite this small leakage. In this laboratory an electrically driven vacuum pump is used, and this has proved more than capable of maintaining the necessary vacuum.

Although some trial and error will be necessary before definite times for fusing can be determined, on the furnace illustrated the following times have been found to be satisfactory:—

1st Bake: 5 min. at 1 (drying out),
5 min. at 2 (dull red),
1½ min. at 3 (full heat).

2nd Bake: Same as 1st Bake, except 2 min. at 3.

The vacuum is applied only during the last 1½–2 min. of each bake. The vacuum must be turned off before the heat. Should the muffle be allowed to cool with the vacuum on, bubbling of the porcelain will occur.

Fig. 3.—Anterior jacket crowns fused *in vacuo* with gas-heated furnace.

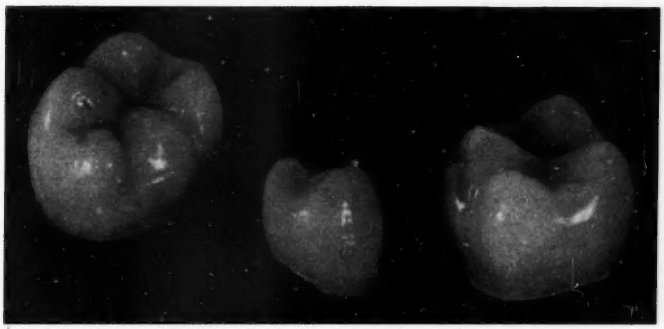


Fig. 4.—Posterior crowns fused by the same method.

A carbonizing flame must be avoided during the vacuum stage of fusing. Some carbon may be drawn in at the lip of the muffle and this will cause blackening of the porcelain.

Glazing.—Apply the glaze powder and fuse for 5 min. at 1 and 3 min. at 3. Vacuum at this stage is not necessary as it serves no useful purpose.

Porcelain fused in vacuum is much more translucent than that fused in normal atmospheric conditions. Should a low-fusing

porcelain be used which is not specially manufactured for vacuum fusing, it will be necessary to make a shade guide of the selected porcelain, fused *in vacuo*.

SUMMARY

A gas-heated vacuum furnace has been described, and details of its construction and use have been given.

Acknowledgements.—I am indebted to my colleagues for their help, and particularly to Mr. J. N. Anderson, Senior Lecturer in Dental Mechanics and Prosthetics, for his assistance and advice. Further work is being done by him on the properties of porcelain fused by this method and it will be the subject of a future paper. Also to Mr. K. Lorimer for the photographs.

REFERENCES

COHEN, M. (1940), *Ceramics in Dentistry*. London: Henry Kimpton.
CUSTER, L. E. (1898), *Ohio dent. J.*, Sept.
FLETCHER, T. (1885), *Brit. J. dent. Sci.*, **28**, 243.
KLAFFENBACH, A. O. (1955), "Vacuum Fired Porcelain," *Iowa St. dent. Bull.*, Oct., 247.
SKINNER, E. W., and FITZGERALD, P. A. (1938), "Physical Properties of Dental Porcelains," *J. Amer. dent. Ass.*, **25**, 861.
TURNER, C. R. (1907), *American Textbook of Prosthetic Dentistry*, 3rd Ed. London: Henry Kimpton.
VERRIER, A. B. (1881), *Dent. Rec.*, **1**, 124.

A New Approach to the Topical Application of Fluorides for the Reduction of Dental Caries in Children

A total of 554 children were divided into two groups. Group I were treated with 2 per cent sodium fluoride, four treatments being given at intervals of 2–7 days. Group II had a single application of an 8 per cent aqueous solution of stannous fluoride.

After eight months the children were re-examined. The results of the study indicate a significant advantage of the single application of stannous fluoride over the four applications of sodium fluoride.

A 20–26 per cent complete reduction in new carious lesions was found with the group treated with 8 per cent stannous fluoride solution.—FISH, CHARLES W., HOWELL, CHARLES L., and MUHLER, JOSEPH C. (1957), *J. dent. Res.*, **36**, 784.

Early Orthodontic Treatment

Malocclusions are often accompanied by dentofacial abnormalities, oral habits, abnormal muscular patterns, and psychological problems.

These factors may appear individually or in varying combinations. They may be aetiologic to the malocclusion or produced by it. In either event an evaluation of these factors should accompany the orthodontist's dento-skeletal analysis for a diagnosis in keeping with the health and welfare of the individual child.

There is almost universal agreement that early treatment is desirable in the following conditions: (1) All cross-bites, anterior and posterior; (2) All cases of mesial and distal tipping or drifting of permanent teeth; (3) Imminent transpositions of lower permanent lateral incisors and permanent canines and upper first premolars and permanent canine teeth; (4) Irregularities caused by supernumerary teeth; (5) Congenitally missing tooth conditions; (6) Conditions caused by tumours, cysts, rickets, and congenital clefts of all kinds; (7) Ankylosed deciduous tooth irregularities; (8) Ectopic eruption of teeth.

However, in the mixed dentition stage there are other conditions upon which there is no uniformity of opinion as to the advantages of early treatment. These may be listed as follows: (1) All malocclusions caused by habits; (2) Severe protrusion or crowding of anterior teeth; (3) Deep anterior overbites; (4) Developing Class 2 or distal occlusion cases; (5) Malocclusions related to speech disorders.

These conditions as a group usually present abnormal muscular function and undesirable facial æsthetics.

There is an intimate relationship between muscular function, habits, facial form, malocclusions, and the emotional health of the child. Individually or in any combination these factors frequently present valid reason for early correction.—GEIGER, A. M. (1957), *N.Y. St. dent. J.*, **23**, Nov.

A COMPRESSION ODONTOME AND ITS POSSIBLE RELATIONSHIP TO ABERRANT CROWN FORMS

By **A. D. HITCHIN**, D.D.Sc., M.D.S., F.D.S. R.C.S.,
and **H. W. FERGUSON**, L.D.S., F.D.S. R.C.S.
Dundee Dental School, Queen's College, University of St. Andrews

THE term "odontome" has been variously defined by different workers, notably Bland Sutton (1887), and Gabell, James, and Payne (1914), and although no generally accepted definition of the term has so far been suggested, yet all investigators would concede that an "odontome" is derived from the cells concerned with tooth development; and that they are due either to some embryological mishap (Thoma, 1954), or are inflammatory in origin (Hutchinson, 1954, and Stones, 1954). Moreover, there is no one classification of odontomes which would be accepted by all investigators. It is not, however, the purpose of this paper to discuss aetiology and classification of odontomes in general, but rather to describe a particular case of what may be defined as a compression odontome, and to postulate the possible relationship between it and aberrant crown forms of lower premolars.

Fig. 1.—Right lateral oblique radiograph, showing odontome $\overline{54|}$ region.

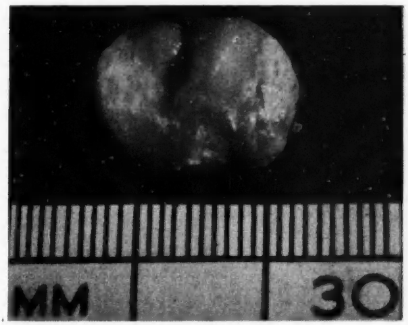


Fig. 2.—Macroscopic appearance of odontome.

CASE REPORT

The patient, a female, aged 42, presented with pain in $\overline{654|}$ region. The remaining lower teeth had been removed elsewhere eight months previously and a lower denture provided. History of the primary dentition was unobtainable.

ON EXAMINATION.—Full upper and lower acrylic dentures were being worn. A well-defined hard swelling was palpable in $\overline{54|}$ region, but the oral mucosa was normal in all respects.

Radiographic examination revealed the presence of a well-defined radiopaque mass in close proximity to the inferior dental canal, situated in $\overline{54|}$ region (*Fig.* 1).

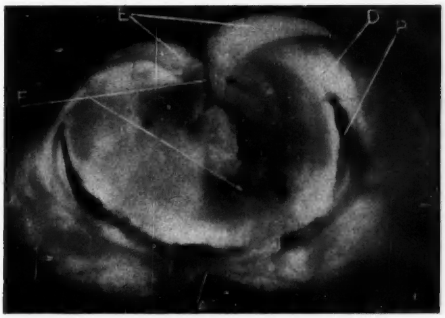


Fig. 3.—Section photographed by reflected light, showing distribution of the dental tissues. F, Fissure extending into depth of specimen; E, Enamel resembling mesial and distal plates of a molariform premolar; D, Dentine; P, Pulp chamber; A, Possible site of apical foramen.

A provisional diagnosis of complex composite odontome was made.

Under endotracheal anæsthesia the mass was easily enucleated after surgical exposure, its surface being in no way adherent to the adjacent bone.

Anæsthesia of the lower lip occurred, but sensation began to return one month after operation. Otherwise recovery was uneventful.

MACROSCOPIC APPEARANCE.—The specimen had the overall dimensions of 10 mm. × 15 mm.

On one side, the appearance suggested two molariform teeth united by their occlusal surfaces (*Fig.* 2). The opposite side, however, was covered with cementum.

A fine disk was used to cut the specimen along its long axis. The two halves were then embedded in clear acrylic, their surfaces polished and photographed by reflected light. One of them is shown in *Fig.* 3, demonstrating the distribution of the dental tissues.

It will be noted that the pulp chamber is clearly defined and is seen to be semi-lunar in section. On the under-surface of the specimen, a distinct depression was noted which was thought to be the apical foramen. An attempt was therefore made to grind the section down in order to see if the depression communicated with the pulp chamber, and although the distance between the cementum and pulp chamber was greatly reduced an actual communication between the two was not clearly established.

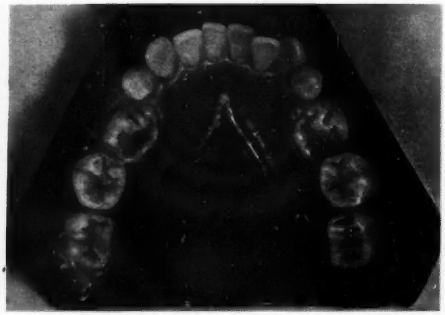


Fig. 4.—Model showing large molariform type of second premolars. Third molars unerupted and demonstrated radiographically.

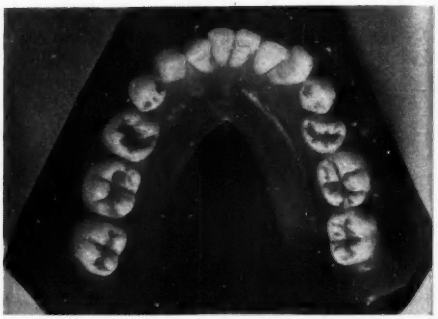


Fig. 5.—Model showing large molariform left lower second premolar and the right lower second premolar also large, but presenting appearance of a compression form.

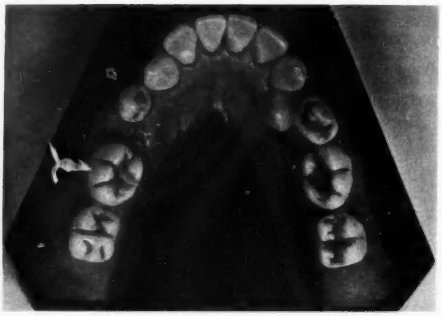


Fig. 6.—Model showing a large right lower second premolar with appearance of compression form. Lower left second premolar unerupted—*see Fig.* 7. Third molars also unerupted.

Fig. 7.—Radiograph of lower left premolar region showing molariform second premolar. Model is shown in *Fig.* 6.

DISCUSSION

From a study of the morphological characteristics of the specimen it is evident that it does not resemble any of the types of odontomes included in the present systems of classification. It does, however, bear a close resemblance to an unusual, large, and molariform type of crown form of lower second premolars which is sometimes seen. Models of three patients with these abnormal crown forms are shown in *Figs.* 4–6.

In each of the three cases illustrated the condition is bilateral, the lower left second premolar in the third case (*Fig.* 6) being unerupted as revealed by the radiograph (*Fig.* 7).

It is also evident that as far as the abnormality of morphology is concerned, gradation exists between the three specimens, the crown form of the second premolar in *Fig.* 6 being

almost within the range of normal, while those of *Fig.* 4 are entirely abnormal in both shape and size. In *Figs.* 5 and 6 the right second premolars can be described as compression forms.

In considering the possible aetiology of these conditions, the fact that a bilateral distribution exists in the three cases would seem to discount trauma and infection as possible causes and a morphological aberration in the developing tooth germs of genetic origin would therefore seem the more likely cause.

The following hypothesis is therefore suggested which offers a possible explanation of the origin of the odontome described.

The presence of an hereditary factor may cause the development of a morphological aberration of the second lower premolars especially in respect of their dimensions. (Compare the sizes of the second premolars in *Figs.* 4–6 with the normal.) The tooth germs of such lower premolars would be situated between the mesial and distal roots of the second deciduous molars and with the rapid growth in size of the premolar germ, which must occur particularly in those cases where there is this hereditary factor, considerable mesio-distal pressure would be produced upon it. In most cases, this would lead to absorption of the roots of the deciduous predecessor, but if the pulp of that tooth was dead then this absorption might not occur; in which case, the pressure produced would be very great and the tooth germ of the second premolar would be markedly compressed mesio-distally. Since the second premolars in the case illustrated in *Fig.* 4 are larger than the first permanent molars and much larger than their deciduous predecessors, their tooth germs must have been subjected to great pressure during their growth, even though the roots of the deciduous molar may have absorbed normally.

This pressure produced by growth might cause the cusps to collapse before the fissures had calcified to produce the effect seen in *Figs.* 2 and 3. The continued pressure could also cause an early atrophy of the epithelial sheath of Hertwig, which would explain the absence of root formation, though the roots of molariform lower premolars are often very short (*Fig.* 7).

It is suggested that the anomaly in this case may have developed in this way and for this reason the term "compression odontome" is advocated.

It is known that in cases of cleido-cranial dysostosis, owing to impaired bone absorption, pressure effects can produce compression crown forms in permanent teeth (Rushton, 1937). When an abnormally large premolar is developing, it is suggested that even in the otherwise normal patient, a compression form may arise. Whilst it is felt that the specimen described in this paper is sufficiently abnormal to be described as an odontome, the difference between a compression crown form and a compression odontome is one of degree.

SUMMARY

Compression crown forms may occur in patients with molariform lower second premolars.

An unusual type of odontome from the lower premolar region is described and the theory postulated that it has arisen from mesio-distal pressure on the tooth germ of a molariform second premolar tooth. The term "compression odontome" is advanced.

Acknowledgement.—We wish to express our thanks to Professor P. J. Stoy for permission to use the model of his case in *Fig.* 4.

REFERENCES

Bland Sutton, Sir J. (1887), *Trans. odont. Soc.*, **20**, 32.

Gabell, D. P., James, W. W., and Payne, J. L. (1914), *Report on Odontomes.* London: British Dental Association.

Hutchinson, A. C. W. (1954), *Dental and Oral X-Ray Diagnosis.* Edinburgh and London: E. & S. Livingstone.

Rushton, M. A. (1937), *Brit. dent. J.*, **63**, 641.

Stones, H. H. (1954), *Oral and Dental Diseases.* Edinburgh and London: E. & S. Livingstone.

Thoma, K. H. (1954), *Oral Pathology.* London: Henry Kimpton.

STUDENT SUBSCRIBERS

Students are reminded that they may become subscribers to the Dental Practitioner at half the normal subscription (£1 1s.) provided their order is signed by the Dean of their Faculty.

THE USE OF SUGGESTION AND PSYCHOSOMATICS IN DENTISTRY*

By S. IRWIN SHAW, D.M.D., M.Ed., *Detroit*

INTRODUCTION

Psychosomatic dentistry is the application of suggestion to a patient for dental purposes in a manner which causes a reaction between the patient's psyche (the mind) and his soma (the body) to produce complete relaxation in the dental chair.

The depth of this response varies in different individuals and one patient may relax and remain awake, while another may go into a so-called sleep state. This latter response is referred to as "psychosomatic sleep", and in this relaxed condition which may be compared with that of "day-dreaming", the patient only appears to be asleep because of body limpness with eyes closed, but actually he has not lost consciousness and he hears the voice of the dentist, accepting the suggestions given and responding with his "soma" to make the necessary dental work pleasant and agreeable.

Over 2000 dentists in the United States are now using dental psychosomatics in their daily practice, and various societies for its study and research have been organized in different parts of the country. The Michigan Society of Psychosomatic Dentistry is the latest group to be so organized, and plans are in progress for the formation of a National Society in this field.

The first dentist on record to use psychosomatic sleep for painless extraction of teeth was Jean Etienne Oudet, of Paris, in the year 1837. The method of inducing the sleep state at that time was known as "mesmerism" after its discoverer Franz Anton Mesmer, and the anæsthesia was presumed to be "magnetically" induced by the operator, whose body was supposed to be overcharged with what Mesmer called "invisible animal magnetism". Dr. Braid, a surgeon of Manchester, England, in 1843, found that "mesmerism" was due to suggestion, and he named the trance state "hypnosis" because of its resemblance to natural sleep. Through lack of understanding from the very beginning, and also because of adverse publicity by showmen and writers of fiction, hypnosis was rejected all through the years by the medical and dental professions as well as the general public. To-day, with a better understanding of the workings of the mind and the two-way reaction between the mind and the body, the new term "psychosomatic sleep" has become acceptable, and its use has become general in the practice of psychosomatic medicine and psychosomatic dentistry.

EVALUATION

The patient who accepts suggestion for dental psychosomatics responds by becoming completely relaxed in the dental chair, and he allows the dentist to perform any type of dental operation, without resorting to those usual nervous gestures peculiar to the apprehensive patient. Without the frequent need for a "drink of water", or excessive patient conversation, or perhaps hand-raising or head-bobbing, more work can be done in the allotted time, and with suggested anæsthesia, the patient not only finds that the time in the chair has passed very quickly, but the session has been agreeable and pleasant so that he looks forward to enjoying his next visit.

For operative procedures the psychosomatic sleep state enables a patient to overcome objection to the noise of the dental drill, to the needle if injections are to be used, or to overcome other phobias and idiosyncrasies related to the dental office. The anæsthesia suggested in dental psychosomatics can be terminated as soon as the operation is completed when so desired, thus sparing the patient the discomfort of waiting for the tissues to return to normal as is the case with local anæsthesia.

In oral surgery, dental psychosomatics can help control hæmorrhage and reduce the flow

* A paper delivered to the American Dental Society of Europe, July 11, 1956.

of saliva, and the patient who accepts suggested anæsthesia may also be assured of no post-operative shock, no after-pain, and only a minimum of swelling.

Patients with sensitive palates may have impressions taken without gagging, and the edentulous patient who responds can be enabled to relax and register a true centric relation and also a correct vertical dimension for the construction of dentures. These same patients have no difficulty in adjusting to the new dentures because they readily accept the suggestion that the new teeth will feel comfortable and feel as if they belonged in the mouth.

For those patients unable to take a local or general anæsthetic because of heart or kidney conditions, or for the apprehensive hæmophiliac who is afraid of the consequences following a needle puncture, psychosomatic sleep becomes the only means for performing dental services with a minimum of risk and discomfort to the patient.

It can readily be seen that dental psychosomatics is of value to both patient and dentist. However, to obtain this gratifying response it is necessary to spend some time with the patient, perhaps from 15 to 30 minutes for the first induction. With some patients the necessary conditioning may require 2 or 3 visits, but once the patient has learned how to respond, subsequent visits require only a matter of seconds for induction into the "sleep" state.

Dental work under these conditions is less fatiguing, and in addition, dentists using psychosomatic sleep in their daily practice report that they are in a more agreeable frame of mind while at work. All these dentists are agreed that the time spent with the patient at the first visit to get this response is well worth while.

PHENOMENA RELATED TO PSYCHOSOMATIC SLEEP

The relaxation of psychosomatic sleep is accompanied by certain phenomena which are characteristic, and are the basis for classifying the patient's depth of response. Psychosomatic medicine makes use of all these phenomena, but in dentistry we only use Rapport, Post-hypnotic Suggestion, Anæsthesia, Amnesia, Hypermnesia, and Age-regression.

Rapport is an emotional state related to the two-way flow of feeling in the interpersonal relationship between patient and dentist, in which the individual accepts the dentist, and in full co-operation the patient exerts every effort to please the operator.

Post-hypnotic Suggestion is the ability of the responsive patient to carry out in the waking state at some later date, a suggestion given in the psychosomatic sleep state. It is post-hypnotic suggestion which enables our patient to respond in a matter of seconds at the visit following his original acceptance of the sleep state. At this first induction the patient is given post-hypnotic suggestion that in the future he will immediately respond to a given signal at each subsequent visit, and will go into a deep state of relaxation whenever this particular signal is applied. Post-operative well-being is also accomplished by the use of post-hypnotic suggestion.

Anæsthesia in the psychosomatic sleep state can include *all* the senses, and in addition to suggestion for painless operation in the mouth, the patient will accept the suggestion for deafness to the hum of the dental drill or other noises.

Amnesia, the ability to forget, is present without suggesting it in patients who respond by going into the deep trance state of psychosomatic sleep, but it can be suggested to the patient in the medium trance where it is desired to remove the influence of traumatic dental experience early in life, in order to make dentistry more acceptable at the present time.

Hypermnesia, the ability to recall the past, is used in psychosomatic dentistry together with *Age-regression*, which is the ability to live and reactivate experiences of the past, where it is desired to obtain true centric and a correct vertical dimension in the mouth of an edentulous patient. The responsive patient is able to recall and relive the experience of having all of his own teeth, and in reliving that period of his life he is able to bring his jaws together in correct occlusion. By placing

properly trimmed bite blocks in this patient's mouth these dimensions can be registered and used to construct his dentures.

STAGES OF RESPONSE IN PSYCHO-SOMATIC SLEEP

The depth of response is measured by the phenomena found and classified according to such findings.

1. *Waking* stage of response presents the patient with deep relaxation and rapport—co-operative and exerting every effort to please the operator.

2. *Hypnoidal* stage, the lightest of the sleep states, differs from the waking response in that the patient has his eyes closed. Even though the patient in this stage does respond to simple suggestions, he invariably protests that he was not "asleep".

3. *Light trance* stage, presents symptoms of catalepsy with a feeling of extreme heaviness throughout the body. The patient develops rapport and also glove anæsthesia, and may now accept post-hypnotic suggestion in some instances.

4. *Medium trance* is recognized as a definite response by the patient. There is rapport, post-hypnotic suggestion accepted, as also anæsthesia and amnesia by suggestion.

5. *Deep trance* stage presents all the phenomena of psychosomatic sleep response, and the patient may open his eyes without being awakened from the trance. There is complete amnesia of all activity during the sleep state. Hypermnesia can be suggested, as also hyperæsthesia (increased sensitivity of all the senses), age-regression, hallucinations, and other phenomena used only in psychosomatic medicine and hypno-analysis.

Some patients, classed as insusceptible, will not accept psychosomatic suggestion for some unknown reason, others may consciously object, but since the intellectual standard of those seeking dental aid is at least average, the percentage of insusceptible patients is slight. Dr. Burgess, the psychologist who helped organize the first society of Psychosomatic Dentistry, claims that ninety-five per cent of the average dental clientele are responsive in some degree to suggestion and will respond by accepting some stage of psychosomatic reaction.

SUGGESTION IN THE WAKING STATE

Before taking up the methods for obtaining the sleep state response, the application of suggestion in the waking state should be considered, because we use it every day in our dental practice.

In defining suggestion Weitzenhoffer calls attention to the two meanings, (1) the verbal material which influences an individual, and (2) the process by which the behaviour and mental workings are altered in an individual by influence from without, in the absence of conscious volition on the part of the person thus influenced.

Heron's definition refers to suggestion as an idea, request, or example which the individual accepts uncritically, and which initiates appropriate behaviour.

LeCron implies that anything which influences the thought and action of an individual may be termed suggestion.

In accepting these definitions we must realize that we are subject to negative as well as positive suggestions, and that these can be given indirectly or directly, unconsciously or consciously. Once aware of this, we can realize that the atmosphere of our reception room, the mannerism of the dental assistant, or perhaps our own personality, may indirectly and unconsciously reflect negative suggestions to affect the behaviour of our patients. In particular, the patient who has already been made apprehensive through experiences earlier in life, may as a result of these indirect negative suggestions, become unmanageable, unco-operative, or even aggressive with the ensuing fear and distrust.

To obtain a positive psychosomatic response in the dental patient, his negative attitude must first be overcome, and a positive mind set must be produced in the waking state to neutralize this distrust; to replace it with a feeling of faith and confidence in the operator, with what we call "rapport". To obtain this rapport in the waking state, a pattern of approach along the following steps should be taken, keeping in mind at all times that in the

interpersonal relationship between the patient and dentist there is a *two*-way flow of feeling and the patient may sense any unconscious antagonism or indifference on the part of the dentist (Shaw, 1955).

1. *Reception.* The importance of the first contact with your patient is stressed because of the possible negative impressions which may register through the two-way flow of feeling, and to overcome this we should learn to develop a positive approach and give the impression of confidence to the patient at first reception.

Whether it is acceptable to the patient at this time or not, there is

2. *Recognition* by the patient of your effort to be considerate and sincere on his behalf. His interest in your sympathetic approach arouses his desire to test your sincerity, and we go into the third phase towards establishing rapport with our patient.

3. *Response* follows our effort, and the patient tentatively co-operates. Noting the operator's continued and consistent positive manner, the patient develops a feeling of confidence. Tension leaves, resulting in the next step.

4. *Relaxation*, which brings with it full co-operative action on the part of the patient. He finds himself comfortable in the dental chair now that he is relaxed, and he trustfully accepts the dentist.

5. *Rapport* is now established. The patient in reciprocation of the operator's attitude now exerts every effort to please. There is uncritical acceptance of suggestion in the waking state, so that minor discomforts of dental operation or local injection are tolerated by the patient without any complaint, and the one-time fearful individual is no longer apprehensive in the dental chair. Repeated satisfactory experiences along these lines condition the patient for the future, and tension in the chair becomes a thing of the past for him. He remains calm and relaxed at each visit.

In accepting dental psychosomatics in both waking and sleep response, we learn to keep in mind the emotional aspects involved not only between patient and dentist, but also between an individual and his own unconscious and conscious problems. This includes the dentist himself, and in understanding ourselves better, we can be much more tolerant with our patients, so that we can make generous allowances for the emotional individual seeking dental care. Such patients, being highly sensitive, soon recognize our desire to be helpful, and the sympathetic approach genuinely presented helps to develop the rapport we seek.

DEVELOPING THE SLEEP STATE

In approaching the patient to apply suggestion for the psychosomatic sleep response in dentistry, the same steps for developing rapport are followed as for waking response, excepting that the mind set (the mental attitude) now includes the addition of positive statements regarding the sleep state, and suggestions for relaxation and sleep are also given. The statements regarding the sleep state are aimed at setting the patient's mind at ease.

He is told that the involuntary activities of his body are regulated by his subconscious mind, and that this subconscious accepts any suggestions agreeable to one's conscience, when not influenced by the conscious mind. As a result of this acceptance under such conditions, our instructions are aimed at rendering the conscious mind inattentive, so that the subconscious can work unhampered and respond to the suggestions given.

It is further pointed out that in order to do this, the patient must co-operate and have sufficient faith in the operator to follow the instructions offered for obtaining the desired sleep state.

The patient is next told that he is never unconscious, that he is not asleep in the sense that we know sleep, but will hear all that is said and will pay attention only to what the dentist tells him. It is explained that no special powers are involved; that the patient as an apt intelligent pupil, learns to do this for himself, and that we are only teachers.

While most practitioners of psychosomatic dentistry have their own methods for developing the correct mind set in the patient for acceptance of the sleep state, the use of a printed pamphlet left in the reception room

for the interested patient to read while waiting has been found valuable in that the patient has already been introduced to the subject of psychosomatic sleep in dentistry before he sits in the dental chair. His attitude is formed by the time he gets into the chair, and if favourable, the mind set thus established leads to acceptance of the sleep state with a saving of much time.

The Michigan Society of Psychosomatic Dentistry furnishes its members with the following printed pamphlet:—

A NOTE TO THE PATIENT—WITH REFERENCE TO PSYCHOSOMATIC DENTISTRY

Everyone who has visited a dental office at some time or other has experienced a dislike for dentistry and the dentist, until he learned to accept the dentist as his friend. When this happens the patient becomes much more relaxed and he is able to accept dental work without too much apprehension.

However, there are quite a number of people who have been unable to accept dentistry in a favorable light. These patients develop a nervous feeling each time they visit the dentist, and with this feeling of discomfort they experience a tightening of muscles all over the body while in the dental chair.

We call this "nervous tension" and it is the result of a definite relationship between the mind and the body. Psychosomatic dentistry is a new field in dentistry dealing with this relationship, and its aim is to relax the patient while at the dental office and make all dental work agreeable.

Your dentist is able to do this for you if you wish to benefit by this new approach to modern dentistry, and you are willing enough to co-operate in accepting the suggestions which lead to complete relaxation in the dental chair. Psychosomatic sleep follows your acceptance and relaxation.

This response is identical with the so-called sleep state of hypnosis, and it resembles the relaxed condition of "day-dreaming". It should be definitely understood that a patient in psychosomatic or hypnotic sleep is never unconscious. He merely appears to be asleep because the eyes are closed and the body is limp with deep relaxation. Just as is the case with "day-dreaming", the patient is aware of surrounding activities but there is no desire to pay attention to anything else but the dentist's voice, which is distinctly heard repeating suggestions for relaxation and anæsthesia during the course of working within your mouth.

In your relaxed condition the suggestions are accepted and the dental work is agreeable due to the anæsthesia developed in this seeming sleep state. Since there is no tension whatsoever, the patient is very comfortable and the time in the chair passes very quickly. You leave the dental office fresh and rested, even more so than when you entered, and you look forward to your next visit with pleasant anticipation.

There are different depths of response to psychosomatic suggestion and some patients go into a heavier state of relaxation than others. Nevertheless the individual who responds at all, learns to go into a deeper state, going deeper with each visit after the first successful response. Even the skeptical patient can respond when the instructions given by the dentist are followed in a co-operative manner.

This application of psychosomatic sleep to dental work calls for a knowledge of psychology and dental psychosomatics on the part of your dentist. Your dentist has already attained this skill by a course of study and training in this new field of dentistry, and he is a member of the Michigan Society of Psychosomatic Dentistry. These qualifications enable him to teach you how to relax in the dental chair so that you can be comfortable while your work is being done, and you can benefit fully by all the advantages to be obtained through psychosomatics applied to dentistry.

(*Copyright*, 1955. *Michigan Society of Psychosomatic Dentistry*.)

The patient who becomes interested after reading this kind of primary mind set will ask for further details on psychosomatic dentistry. An uncritical acceptance of the answers given will add to the prestige factor, established while reading the printed pamphlet, and the patient is ready for testing his ability to co-operate and respond to suggestion. The purpose of these tests is explained, and the patient is told that since the acceptance of suggestion is dependent upon imagination, concentration, and strong will on the part of the subject, time can be saved by testing him for these desirable qualities.

Many dentists by-pass these suggestibility tests, considering them unnecessary. One of my own techniques, however, makes use of the test, and it also serves as an induction method whereby the patient goes directly into the sleep state immediately after a strong positive response to the test.

One of the reasons put forth by those not using tests for suggestibility is that there is always the possibility of a patient developing a negative mind set with the feeling of inability to respond, where there is failure in testing for response to psychosomatic suggestion, even though the patient may not belong in the insusceptible class. These dentists follow the practice of applying one of the induction methods directly after establishing the mind set, and if the patient fails to accept the sleep state at this time, they explain that different patients respond to different methods, and the dentist follows through with the application of one of the other methods of induction.

INDUCTION METHODS

These are classified as direct or indirect methods of approach. With a direct induction the patient is fully aware of the fact that he is co-operating and applying himself towards relaxing for the purpose of accepting psychosomatic sleep, and the mind set in these instances is based upon such an understanding. Where there is the possibility of not being able to establish such an understanding as is the case with children, or where uncritical acceptance of the procedure may not be obtainable in a patient for other possible reasons, the indirect method of induction is used, and mention of psychosomatic sleep is deliberately omitted. Instead of stressing the advantages of psychosomatic sleep, the patient is impressed with the value of complete relaxation, and in accepting this mind set, responds by relaxing to the point of going to sleep when the suggestion to sleep is given.

Both direct and indirect methods aim at rendering the patient's conscious mind sufficiently inattentive to reduce his sensory intake to where the sense of awareness limits itself to his narrowed focus of attention. At the same time the patient, comfortably seated in the dental chair with his motor output at a minimum, is given repeated verbal suggestions to relax, and without conscious interference by the patient's reasoning processes, these become acceptable to his subconscious mind. The body responds following this mental acceptance and the patient puts himself into psychosomatic sleep when this suggestion is given.

Direct Induction.—The generally accepted method for use in the dental office is known as the Eye Fixation Technique. Part of the mind set in the direct approach calls for an explanation of the technique which is to be used, and the patient is told that by concentrating his eyes on a certain spot above the line of vision, his eyes will become tired and he will soon become drowsy, and with continuous concentration on this spot his conscious mind will exert less influence on his subconscious, so that suggestions will become acceptable without interference from the conscious mind. The spot used for this eyestrain may be on the ceiling, or it can be the chair light, the end of an instrument, or even the point of a finger.

The patient is then asked if there are any questions which remain to be answered, and if not, he is told to concentrate his eyes on the particular spot chosen. It is suggested that as the eyes tire, the eyelids get heavier and heavier, and that the patient gets drowsy and sleepy with this heaviness, so much so that when we count up to seven he will be so heavy, so drowsy and so sleepy, he will immediately close his eyes and go into psychosomatic sleep when the suggestion to sleep is given. It is added that he may even close his eyes as soon as the feeling of heaviness and relaxation creeps over him, even before the count of seven is reached. We then proceed to count up to seven very slowly, adding suggestions for relaxation and heaviness between counts, so that the responsive patient goes to sleep when seven is reached. The patient is tested for relaxation at this stage by raising his arm, and noting his response. If the arm falls as a dead weight into the patient's lap, there is a positive response with deep relaxation. Where the arm is returned to its former position by the patient himself, there may be only a slight response or none at all. If the arm remains poised and rigid in mid air, we may have attained one of the deeper trance responses, and this is recognized when a rotary movement of the arm in this position started by the operator produces a continuous circular movement until stopped by the dentist. With this type of response the patient is immediately ready for the suggestions necessary to the kind of dental service to be performed, otherwise the suggestions given are for the purpose of enabling the patient to put himself into a deeper state of relaxation.

When the proper depth is reached, and the patient accepts one of the stages of psychosomatic sleep, the suggestions for dental procedure are given.

Indirect Induction.—There are two indirect methods employed in the dental office as a rule (Moss, 1952), the Relaxation Technique

and the Picture Visualization Technique. Moss in his book on Hypnodontics describes these methods in detail in Chapter X.

In brief, the Relaxation Technique requires a mind set on the advantages of relaxation, and in teaching the patient to develop the feeling of heaviness that goes with it. By repeatedly holding the patient's right hand and letting it fall into his lap until this heaviness is reached, the patient learns what is meant by relaxation. When he has learned to develop this heaviness in both arms, he is asked to close his eyes and imagine this same feeling of heaviness in the feet and legs. Suggestions are given to encourage full limpness in the limbs, and these are continued to include the entire body. The patient's arm is raised and let fall to test the response, and he is complimented when relaxation is evident. Following this acceptance suggestion is given to carry the relaxation and heaviness into the comfortable realm of sleep. Further suggestions for heaviness, drowsiness, and sleep produce the psychosomatic response in the passive and co-operative patient. To deepen the sleep response and produce anæsthesia or any of the other phenomena related to the patient's dental needs, the procedure is similar to that used with the direct method of induction.

The Picture Visualization Technique requires a mind set which stresses the fact that where the mind is intensely occupied with a particular thought or activity, the field of awareness fails to register certain cuts or bruises which otherwise would be painful. The patient is reminded of such happenings to himself, and when he recalls such experiences, he is told that by closely concentrating on a television programme or on a movie, he can become unaware of the work being done in his mouth, in the same way that the unknown body bruises did not register when they occurred. Following this mind set the patient is asked to close his eyes and to concentrate on his favourite T.V. programme. He is told that as the picture in his mind gets clearer and clearer, he will relax more and more, and as he does so, he relaxes completely to accept the suggestion to sleep.

This method works very nicely with children, and positive results have also been obtained with adults when the indirect method was considered more appropriate than the direct approach.

In concluding this paper I would like to present a recent case which might be of interest in that it shows how the most difficult patient can become co-operative through the use of suggestion and dental psychosomatics. This case report illustrates how even in unusually rare cases, when a patient through psychological involvement is so difficult as to appear hopeless, the positive approach can be helpful.

CASE REPORT

The patient, a young girl of sixteen, was referred to me for de-conditioning to overcome the fear she had developed against dentists and dentistry. Four or five different dentists had made various attempts to cater for the girl, but nothing could remove the dread and resistance to work being done in her mouth.

The history showed that this strong aggression and tremendous fear had developed only recently. She had always been timid and reluctant to go to the dentist, but in spite of her nervous apprehension she had built up confidence and rapport with one pediodontist. However, when this man was called into the Army the patient developed a feeling of insecurity in relation to other dentists, and she was taken from one dentist to another without results. The need for dental care became so great, the patient was eventually prevailed upon to accept general anæsthesia for the preparation and insertion of a number of fillings. This was done by another pediodontist at one of Detroit's hospitals and there remained endodontic work to be done by a specialist in that field.

After repeated attempts to give a mandibular injection in his office, the endodontist referred this girl to me. She responded to the Picture Visualization technique within 15 minutes, and accepted the medium trance state. Post-hypnotic suggestion for relaxation and full co-operation were given at this first visit, and on leaving, the patient smiled as she said "Goodbye". Her mother remarked that it was the first time her daughter had ever smiled in any dental office.

After five visits to my office, during which time the patient had learned to relax in the dental chair and to accept suggested anæsthesia, the girl herself considered she was ready for the root-canal work at the endodontist's office.

The patient made her appointment with the endodontist, but when she presented herself at his office her face was sullen and her manner aggressive as before, yet when she sat down in the dental chair she became relaxed and went to "sleep" at the given signal. However, the moment the endodontist approached her, she sensed his presence and opened her eyes. In spite of the de-conditioning and post-hypnotic suggestions for relaxation and co-operation with this specialist, the patient refused to have anything done. The endodontist left the room and the patient again relaxed, closed her

eyes and responded to the suggestion to "sleep". When on testing, her arm dropped with heavy relaxation, the specialist returned and again approached the girl. Once more resistance showed itself, this time with abject fear in her eyes, and body trembling with considerable emotional upset. With this demonstration of fear it was decided to dismiss the patient, and to accept her back only after she had allowed herself to receive local injections at my office.

At the next visit to my office, the patient readily accepted an upper buccal injection under suggested gum anæsthesia. The following visit she was again receptive to gum anæsthesia and accepted a mandibular injection without any opposition whatsoever. At the succeeding visit another mandibular injection was given painlessly, and suggestions were given that she imagine this was being given at the endodontist's office, and that the injection would in no way disturb her. Post-hypnotic suggestions were added to the effect that the successful response in my office would be repeated any time she needed a local anæsthetic injection in any dental office, and that she would now be agreeable and relaxed while accepting the injection at the endodontist's office.

Wishing to be absolutely sure of a positive response at the endodontist's office the patient was again required to return for further conditioning until she herself was sure of accepting the injection. At the next visit the girl accepted the mandibular injection in the *waking* state without objection, and it was pointed out that she could tolerate the similar procedure when she went for the necessary root-canal work. After three more visits the patient made her own appointment with the endodontist, and this time she insisted that her friend accompany her instead of her mother.

Even though the patient was much more agreeable this time, and responded with deeper relaxation in this office, she again opened her eyes when the endodontist approached her. The severe emotional display of the last visit to this office was lacking, but still the patient refused the injection, and she clung to my arm as she asked why I couldn't give it.

The specialist was agreeable, but I explained that the purpose of her visits to me was to enable her to receive such anæsthesia from *any* dentist. The injection was the same regardless of who gave it, and I added that if she closed her eyes she could imagine I was giving the injection. I also said that unless she co-operated immediately I would leave and refuse to help her any more.

After a few minutes when it seemed no co-operation was forthcoming, I made my departure very obvious by saying "Goodbye" to everyone, and slamming the door as I left the operating room. However, I waited in the endodontist's private office, hoping that the patient's ego needs required my support in the role of "father-figure" to such an extent as would make her accept the injection rather than lose my friendship. This might have been the case, or perhaps the rapport between us was so strong, the patient could not bear to disappoint me, because the endodontist soon came into his private office to tell me that the patient had asked for the injection and had already received it.

I went in to see the patient and to let her know she had not been abandoned, and at the same time I complimented her on her achievement. She was all smiles and proud of her victory. From then on she kept all her appointments with the endodontist, smiling and agreeable all the time so that she was now a welcome patient.

The various significant psychological factors involved in this difficult case have been deliberately left out since their treatment belongs to the psychologist, but this unusual case is presented because of the extreme difficulty in overcoming the patient's deep-seated unconscious resistance, and also to demonstrate the urgent need for sympathy and consideration of the patient in using suggestion and psychosomatic sleep in the practice of dentistry.

Please keep in mind that this particular case presents the unusually rare patient, and will hardly be met with in your everyday practice.

Some of the material in this article was previously published in *Clinical Applications of Hypnosis in Dentistry* and is reproduced by kind permission of the publishers, Messrs. W. B. Saunders Co.

REFERENCES

BURGESS, T. O. (1951), *Hypnodontia—Hypnosis as Applied to Dentistry*. Cal (Coe Lab. Inc.), Feb., Mar., and April.

HERON, W. T. (1950), *Clinical Application of Suggestion and Hypnosis*. Springfield, Ill.: Chas. C. Thomas.

LECRON, L. M. (1947), *Hypnotism Today*. New York: Grune and Stratton.

MOSS, A. A. (1952), *Hypnodontics, Hypnosis in Dentistry*. Brooklyn: Dent. Items of Interest Pub. Co.

SHAW, S. IRWIN (1955), "Behavior Control by Suggestion", *J. Dent. Child.*, **22**, No. 2.

WEITZENHOFFER, A. M. (1953), *Hypnotism. An Objective Study in Suggestibility*. New York: John Wiley and Sons.

Study of Occlusal Surface Contacts in Artificial Dentures

Full upper and lower dentures were made, following various prescriptions for the arrangement of the posterior teeth, and the surfaces of the posterior teeth were made electrically conducting. With the aid of Brush recorders, records were made of the occlusal contacts while chewing various types of food. It was observed that contacts were invariably made on the non-chewing side but, other than that, no information was gained that might support a preference for one or other of the various types of occlusion that were tested. A more refined study is planned.—KAIRES, A. K. (1957), *J. pros. Dent.*, 7, 553.

A CASE OF RE-IMPLANTATION OF TEETH AFTER FIVE DAYS

By J. N. W. McCAGIE, F.R.C.S. (Edin.), F.D.S. R.C.S. (Eng.)
Royal Dental Hospital

MOST practitioners have at some time re-implanted dislocated teeth. The results vary, but are generally disappointing and the reason for this is not clearly understood. The following case illustrates the point that the actual operation of re-implantation is always possible, whatever may be its eventual result.

CASE REPORT

In April, 1955, a woman of 37 was involved in an accident abroad. She suffered a severe blow in the face which resulted in extensive comminution of the buccal plate in 4–1|1–4 area with dislocation of 32|123, 1| being knocked out. The next day she consulted a dental surgeon who removed 1|. She returned to London with 1|1 wrapped in a piece of newspaper, and was first seen on April 20, 1955, 5 days after the accident.

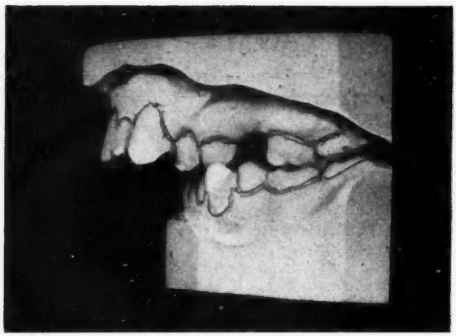


Fig. 1.—Models showing extreme superior protrusion of the case.

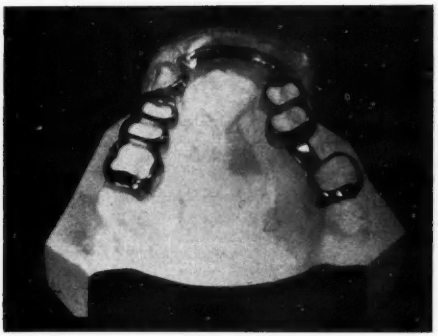


Fig. 2.—Metal cap splint with a clear acrylic front.

When first seen the face was still considerably swollen but this was rapidly improving. 32| were quite loose while |23 were mobile but apparently in place. Vitality tests of all four teeth were negative.

The position was complicated by the extreme superior protrusion (*Fig.* 1) and the patient was very anxious not to be without teeth. Replacement of 1|1 by an immediate denture would not have been satisfactory without splinting the other teeth and a satisfactory denture would really have required an alveolectomy and replacement of 32|234. Together with the loss of 1|1 this would have meant losing seven teeth in all, and after her unfortunate experience, the patient felt that she really could not face such a procedure. The alternative, therefore, of re-implantation was proposed and accepted.

Under local anæsthesia a buccal flap 321|123 was reflected and all loose fragments of bone—amounting to practically the whole of the buccal plate—were removed. The flap was replaced, and 1|1 re-inserted and a zelex impression taken.

While a temporary cap splint of "quick cured" acrylic was being prepared 1|1 were removed, together with 2| which had come out with the impression. The apices were removed and the canals filled with zinc oxide. All teeth were then replaced and the splint cemented into position.

Two days later, the temporary splint was replaced by a metal cap splint with a clear acrylic front (*Fig.* 2). No special antiseptic procedures were employed, the dislocated teeth being thoroughly washed under the tap and left in normal saline, but aureomycin (0·25 g., 6-hourly) was given for 3 days after the re-implantation.

The subsequent course was uneventful. The splint was removed after 2½ months and the teeth found to be only slightly mobile.

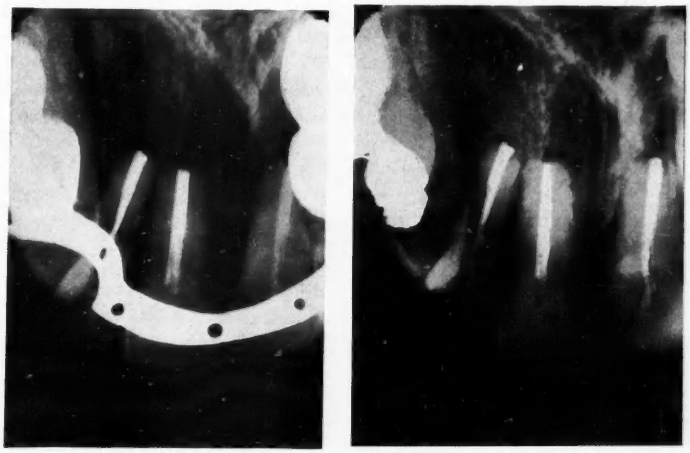
Radiographs were taken at intervals and showed good bone regeneration (*Fig.* 3). The replaced teeth are firm and not noticeably discoloured and there is evidence of vitality in |23.

DISCUSSION

Many cases of re-implantation of teeth have been reported in the literature, and opinion in this country is well summarized by Lovel and Hopper (1954), who take the view that most re-implanted dead teeth are gradually resorbed in about 2–3 years by the process which they describe.

Continental authorities on the other hand take a different view, and Kromer (1948), of Norway, root fills and re-implants teeth as a

routine procedure. He gives no survival figures for his own cases but quotes Loos and Faust as expecting an average lifetime of 10 years, the latter claiming this in 93·4 per cent of his cases. Kromer lays great stress on preservation of the periodontal membrane and



A B

Fig. 3.—A, Radiographic appearance at the time of treatment (April, 1955); B, Radiographic appearance in November, 1957.

goes so far as to say that "the lifetime of a re-implanted tooth is directly proportional to the amount of periodontal membrane present on the tooth at the time of re-implantation".

Pleasant (1942), however, recorded re-implantation of teeth in 6 cases, in one of which the tooth—a crowned central—was in the patient's pocket for 7 days. He has one case (personal communication) where a re-implanted $\underline{|2}$ was still in place after 10 years. In all these cases Pleasant carefully removed every portion of periodontal membrane from the root. Most writers agree about the necessity for apicectomy and root-filling and there is general agreement that the presence of infection is no bar to re-implantation.

Douglas (1954) in a review of 7 cases stresses the importance of an intact buccal plate. In the case described in this communication the buccal plate was practically all removed and as the $\underline{1|1}$ were out of the mouth for 5 days it is certain that there would be no surviving periodontal membrane on either of them. $\underline{2|}$ on the other hand was only out of the mouth for about 20 min. and therefore it is likely that the periodontal membrane would be largely viable. One would expect, therefore, that if the presence of a living periodontal membrane was of such importance $\underline{1|1}$ would be showing signs of resorption while $\underline{2|}$ would be intact. Radiographs taken up to $2\frac{1}{2}$ years after the re-implantation show no resorption taking place in the roots of any of the three teeth. This would suggest that the role of the periodontal membrane in such re-implantation is not as important as has been supposed.

SUMMARY

A case of re-implantation of three teeth is reported, two of the teeth having been out of the mouth for 5 days.

After $2\frac{1}{2}$ years, the teeth are firm. There is no evidence of any resorption of the roots of either the tooth replaced at once or of those where re-implantation was delayed.

REFERENCES

Douglas, B. L. (1954), *Oral Surg.*, **7**, 7.
Kromer, H. (1948), *Brit. dent. J.*, **84**, 210.
Lovel, R. W., and Hopper, F. E. (1954), *Ibid.*, **97**, 205.
Pleasant, S. A. (1942), *Ibid.*, **73**, 308.

THE DESIGN OF LOWER FREE-END SADDLE DENTURES*

By D. J. NEILL, D.F.C., F.D.S.
Department of Dental Prosthetics, Guy's Hospital Dental School

THREE outstanding problems exist in relation to the free-end saddle case:—

1. Lifting of the saddles.

2. Concentration of masticatory loads on the bone beneath the distal end of the saddles.

3. Overstress of the periodontal membrane of the abutment teeth.

1. Where a lingual bar connector is used, upward displacement of the distal end of the saddles may occur either due to the adhesion of sticky foodstuffs to the occlusal surfaces of opposing teeth or due to the action of the muscles of the tongue upon the lingual flange. Where adequate retention exists to prevent the displacement of the anterior end of the saddle, rotation will occur about an axis passing through the occlusal rests and this may result in the lingual bar impingeing upon the mucosa on the lingual aspect of the alveolus behind the anterior teeth. The provision of some form of indirect retention will prevent this from occurring and the problem is so simply overcome that I do not propose to dwell upon it.

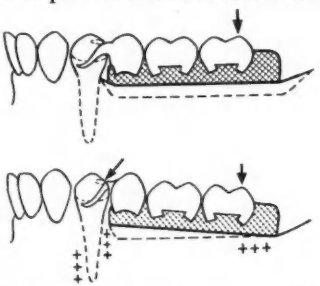


Fig. 1.—Areas of increased pressure resulting from the sinking of a partially tooth-supported free-end saddle denture.

2. The support of a free-end saddle may either be provided by the alveolar ridge alone, which is undesirable on several counts, or it may be shared between the remaining teeth and the alveolar bone. In many instances occlusal support is provided by an occlusal rest on the last abutment tooth (*Fig.* 1). Any sinking of the saddle which may accompany compression of the covering mucosa or resorption of the underlying bone, results in a rotation about the occlusal rests on the abutment teeth, and a concentration of the occlusal load on the alveolar bone at the distal end of the saddle. It seems likely that this excessive pressure stimulates further resorption. The leverage which is thus exerted by way of the saddle increases the torsional stress on the clasped abutment teeth.

3. Whilst a healthy periodontal membrane is capable of successfully withstanding more than its fair share of the masticatory load, there is a limit to the load which it can carry. Frequently the tooth adjacent to a free-end saddle is subjected to overstress by increases in its occlusal loading and by torsional stresses transmitted to it from the saddle by way of rigid clasping.

These last two problems resolve themselves into a consideration of how the remaining standing teeth may be used to assist in bearing masticatory loads without themselves being overstressed, and how the alveolar bone beneath the saddle areas may be subjected to a uniform loading, notwithstanding the effects of bone resorption. The support obtained from the remaining natural teeth in opposing vertical loads applied to the saddle is dependent upon the ability to use rests on these teeth. Frequently these are only applied to the last of the abutment teeth as the utilization of the incisor and canine teeth necessitates the preparation of these teeth to take rest-seats.

Lateral loads applied to the saddles may be shared between the alveolar ridge and the remaining standing teeth by means of rigid connectors and indirect retainers, the loading applied to the teeth becoming greater as the bony ridge recedes. It is felt that thus adequate support may be obtained to withstand

* A paper read before the British Society for the Study of Prosthetic Dentistry, April, 1957.

the lateral forces of mastication without damaging the periodontium of healthy teeth.

The amount by which tissues yield under the forces of mastication depends upon: (1) Their compressibility; and (2) The magnitude of the occlusal load.

The compressibility varies according to the thickness of the mucosa, the amount and nature of the sub-mucous tissue, and in the case of the teeth the hydraulic cushioning of the vessels of the periodontal membrane and the integrity of the periodontal fibres. With regard to the magnitude of the occlusal load, whilst it is theoretically possible to distribute equally a given load between the teeth and saddle areas by means of a compression impression, the masticatory loads are so variable that this is not possible under functional conditions.

By a like token the principle of stress breaking whilst helping considerably to avoid damage to the teeth and supporting bone does not entirely overcome the problem of apportioning the loads evenly to the tissues beneath the saddle.

It is my purpose to consider the shortcomings of conventional designs, to review the attempts which have been made to deal with these problems, and to present a new approach which has given encouraging results in clinical use over the past year.

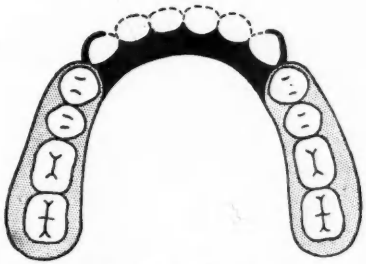


Fig. 2.—Design 1.

Fig. 3.—Design 1(a).

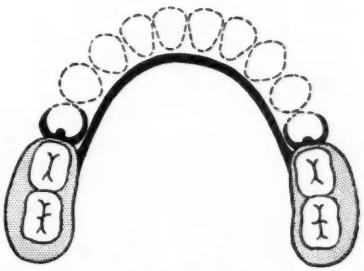


Fig. 4.—Design 2.

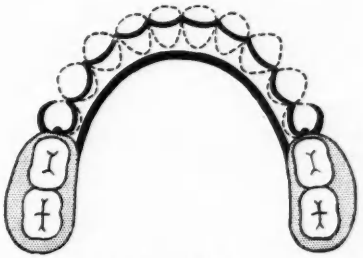


Fig. 5.—Design 3.

Design 1 (*Fig.* 2).—The principal disadvantage of this denture design is the gum-stripping which results when, following resorption of the alveolar bone, the denture sinks.

Design 1(a) (*Fig.* 3).—By incorporating occlusal rests on the last abutment teeth the gingival margins are protected from gum-stripping. Torsional stresses may be applied to the abutment teeth and concentration of the load at the distal end of the saddle will occur following sinking of the denture. In addition stagnation will occur at the gingival margins on the lingual aspects of pre-molar teeth which present lingual undercuts.

Design 2 (*Fig.* 4).—The use of a lingual bar connector together with occlusal rests ensures that no stagnation occurs at the gingival margins. Rotation may, however, take place

about an axis passing through the occlusal rests. Upward movement of the saddle results in the lingual bar contacting the mucosa.

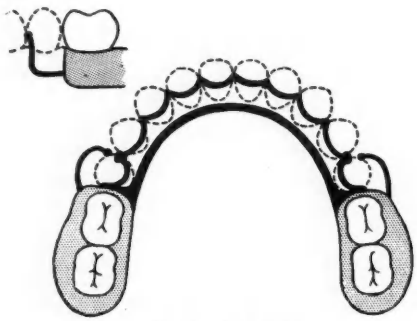


Fig. 6.—Design 4.

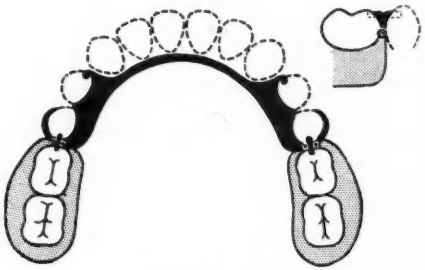


Fig. 7.—Design 5.

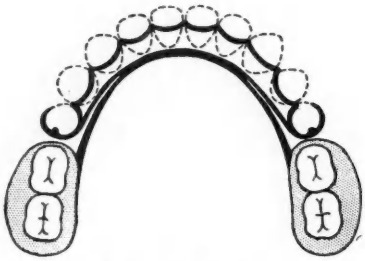


Fig. 8.—Design 6(a).

Fig. 9.—Design 6(b).

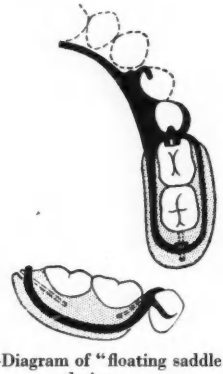


Fig. 10.—Diagram of "floating saddle" denture design.

Following bone resorption or compression of the mucosa, sinking of the saddle may occur with stress concentration beneath its distal end and torsional strain is applied to the last abutment tooth.

Design 3 (*Fig.* 5).—Here the lifting of the distal end of the saddle is opposed by means of an indirect retainer. The saddle may still sink, due to tissue compression or bone loss, with the result that stress concentration and torsional strain on the abutment teeth may still occur.

Design 4 (*Fig.* 6).—In this case the torsional stress on the abutment tooth is eliminated by the use of a point contact gingivally approaching clasp; sinking of the saddle may still occur following bone resorption with the resultant stress concentration beneath the distal end.

Design 5 (*Fig.* 7).—Here a hinge joint of the Fischer type is used eliminating torsional stress on the abutment tooth. Once again sinking of the saddle will be accompanied by a concentration of stress at the distal end of the saddle.

Design 6(a) and (b) (*Figs.* 8 and 9).—These two designs incorporate flexible connectors uniting the retaining unit to the free-end saddles. These are most satisfactory where

attached to the centre of the saddle. The connectors themselves may be poorly tolerated by the tongue, and tissue proliferation is liable to occur between them as stagnation of food debris occurs between the connecting bars, producing inflammation of the underlying mucosa which becomes œdematous and thus

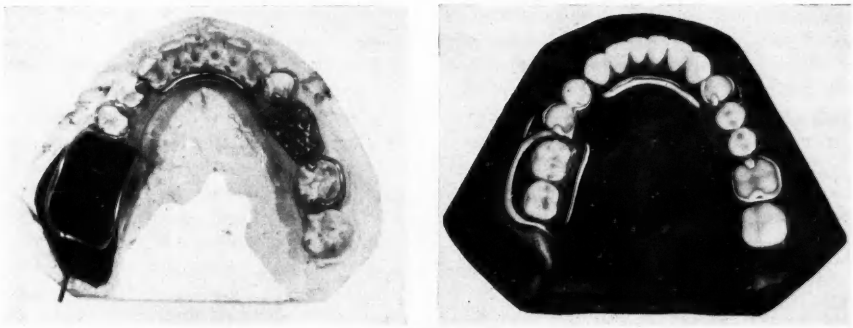


Fig. 11.—Illustrations showing method of attaching saddle to framework

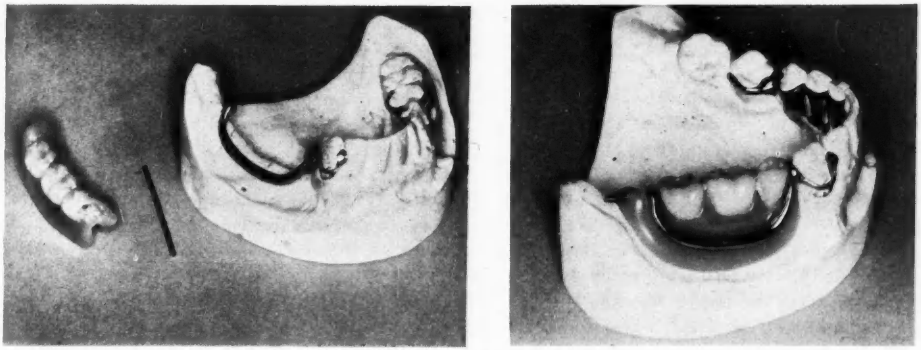


Fig. 12.—Illustrations showing alternative method of attaching saddle to framework when using acrylic teeth.

makes contact with the moving flexible connectors.

Steiger (1952) reporting upon progress in partial denture prosthetics considered the problem of stress distribution in free-end saddle dentures and reviewed a number of systems designed to avoid overstress to the abutment teeth. Many of the solutions propounded necessitated the splinting of the standing teeth by fixed bridge-work or the incorporation of internal attachments in abutment teeth—procedures which, admirable though they may be, call for a high degree of skill in advanced operative techniques and, as Krogh-Poulsen (1953) points out, can for economic reasons only be made available to a very small number of patients.

Realizing the impracticability of such extensive mouth preparation as a preliminary to denture construction on a large scale, several workers have evolved partial dentures of composite construction in an attempt to transfer the articular stresses to the alveolar bone and abutment teeth in optimal proportions. The axial rotation joint of Steiger and the Fischer and Frey systems are examples which may be quoted.

In these and other similar designs a degree of movement of the saddle is allowed through the non-rigid connexion adjacent to the abutment teeth. A very considerable stress must

necessarily be transmitted to these attachments during grinding of the molar teeth, particularly where the alveolus has undergone gross resorption. In addition, although eliminating advanced clinical procedures, construction of many of these appliances in the laboratory is complicated and time consuming.

In conclusion I present a series of illustrations showing details of the design mentioned earlier, which was evolved in the Prosthetic Department at Guy's Hospital Dental School in an attempt to overcome the particular problems of the free-end saddle case.

In this design (*Fig.* 10) the remaining teeth are rigidly braced and clasped and adequate indirect retention is provided. A lingual bar is continued backwards to provide an extension over the ridge at the distal end of the saddle and this unites with a similar bar which passes on the buccal side.

Immediately behind the last abutment tooth a slot is incorporated into the denture framework which faces backwards and receives a metal projection from the anterior end of the acrylic saddle.

At the point of union of the two bars behind the edentulous area the framework is perforated and through this slot is fitted a stainless-steel pin which anchors the saddle to the framework. It fits into a tube in the acrylic saddle and may be retained either by heating it and pushing it into the acrylic or by providing a small bridge of base material behind the framework into which it may be sealed, using autopolymerizing resin. Thus the saddle is supported at each end by stainless-steel pins which are of 0·8 mm. in diameter fitting into slots in the framework (this method of attachment is shown in the accompanying illustrations, *Fig.* 11). These slots are 1·8 mm. in depth and 0·8 mm. in width when cast, and lateral clearance is established when finishing the casting.

These dentures are constructed so that when they are in position in the mouth, and the artificial teeth are occluding with their antagonists, the retaining pins are in contact with the top of the slots and the saddle may, therefore, only move tissue-wards.

In some of the earlier patterns acrylic teeth were used and in these cases the saddle was transfixed by a single stainless-steel pin (*Fig.* 12), but these teeth so readily wore away that porcelain posteriors had to be used necessitating a modification of design in order to allow adequate room for the diatoric structure by means of which these teeth are retained.

Contrary to expectations, patients who have worn these dentures experience little difficulty in keeping them clean and they state that they are more comfortable to wear than more conventional designs.

Resorption of the underlying alveolar bone is followed by sinking of the saddle and movement of the teeth out of occlusion: the saddle, however, does not exert a concentrated load at any part of the alveolus and the leverage which would otherwise be transmitted to the abutment teeth is eliminated.

REFERENCES

Krogh-Poulsen, W. (1953), *Int. dent. J.*, **3**, 496.
Steiger, A. A. (1952), *Ibid.*, **2**, 542.

Extension of Exudate into Supporting Structures of Teeth in Marginal Periodontitis

Mesio-distal and bucco-lingual sections from 15 human jaws affected by periodontal disease were examined microscopically.

It was found that the course of the inflammatory infiltrate was into the bone of the alveolar process and into the gingival tissue itself. Only occasionally were focal accumulations of inflammatory cells observed in the crestal region of the periodontal membrane. No evidence was found to support the experimental observations of Macapanpan and Weinmann who found infiltration into the periodontal membrane of teeth, which were subjected to stresses, and whose gingivæ were inflamed. It is suggested that the findings of these observers were due to the result of acute, continuously active, and severe gingival irritation, whereas in clinical lesions the gingival condition is usually chronic.—Goldman, H. M. (1957), *J. Periodont.*, **28**, 175.

STUDIES IN FACIAL GROWTH

THE MANDIBULAR RAMUS AND THE TEETH

By **JAMES H. SCOTT**

Anatomy Department, Queen's University, Belfast, Ireland

Most text-books on anatomy and dental anatomy state that room is provided at the back of the lower alveolar process for the permanent molar teeth by resorption at the anterior border of the mandibular ramus. This statement is even found in a book, the authors of which should know better (Scott and Symons, 1958)! but it has a highly respectable ancestry going back to John Hunter and Humphreys. It is therefore with some regret that it is the intention of this paper to demolish so ancient and so well-established a doctrine.

Fig. 1.—Radiograph of lower jaw of a child showing the appearance of tooth development (2nd permanent molar) within the ramus.

Fig. 2.—View of same jaw from above showing position of tooth crypt at the back of the alveolar process (alveolar bulb) relative to the ramus.

Fig. 3.—View of lower jaw showing position of erupting 3rd molar relative to the ramus.

THE RELATIONSHIP OF THE ALVEOLAR PROCESS TO THE RAMUS

A radiograph of the mandible (*Fig.* 1) gives the appearance of the molar teeth developing within the lower anterior part of the ramus, but if the same mandible is examined from above, it will be seen that the posterior end of the alveolar process (alveolar bulb), in which the molars develop, lies on the inner side of the ramus (*Fig.* 2).

Fig. 3 shows the third permanent molar in the process of eruption. It will be seen that the anterior border of the ramus lies to the outer side of the erupting tooth and is not involved in the process of eruption. *Fig.* 4 is that of an adult mandible, showing the relationship of the alveolar process to the ramus. It will be observed that the posterior part of the alveolar process lies on the inner side of the ramus. It is therefore not necessary for the ramus to be resorbed to "uncover" the erupting molar teeth.

This is also illustrated in *Fig.* 5, demonstrating the position of the crypt of the 3rd permanent molar and the socket of the 2nd molar relative to the anterior edge of the ramus in a young orang-utan.

THE RAMUS AND THE TEMPORAL MUSCLE

Fig. 6 shows the relationship of the temporal muscle to the anterior edge of the ramus. The anterior tendinous part of the muscle is

attached to the anterior ramal margin down to its junction with the body of the bone.

As the mandible is thrust forwards by growth at its condylar cartilages, the insertion of the temporal muscle would be carried beyond the limits of the temporal fossa, unless there was, at the same time, a continual cutting back of the ramus in front so as to maintain the proper position of the anterior edge of the muscle as the mandible moves forward relative to the skull. The mandible, moreover, is thrust downwards as well as forwards and the alveolar bone ascends by surface deposition beneath the gum so as to maintain the teeth in occlusion. As a result, the junction of the body with the ramus ascends.

While these bony changes are taking place, the lower attachment of the temporal tendon is freed from the bone (Symons, 1954) so that the muscle gradually ascends along the anterior edge of the ramus.

Fig. 4.—View of lower jaw of adult showing the relationship of the back of the alveolar process to the ramus.

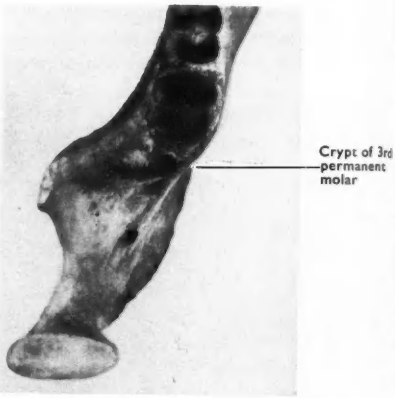


Fig. 5.—Lower jaw of a young orang-utan showing the relationship of the alveolar process (containing crypt of 3rd permanent molar) to the ramus.

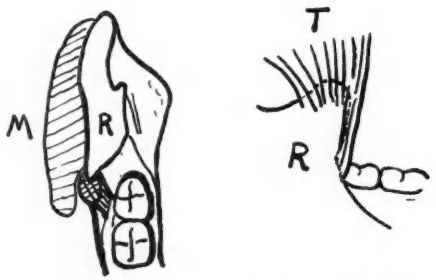


Fig. 6.—Diagrams to show relationship of the insertion of the temporal muscle to the anterior border of the ramus. T, Temporal muscle; M, Masseter muscle; R, Mandibular ramus.

SUMMARY

1. The posterior end of the lower alveolar process lies on the inner side of the ramus. Resorption of the anterior edge of the ramus is not necessary in order to provide space for the erupting teeth.

2. Resorption of the anterior border of the ramus is associated with maintaining the proper relationship between the origin and insertion of the temporal muscle, as the mandible is thrust downwards and forwards by the growth of its condylar cartilages.

REFERENCES

Scott, J. H., and Symons, N. B. B. (1958), *An Introduction to Dental Anatomy*, 2nd edn. Edinburgh: E. & S. Livingstone.

Symons, N. B. B. (1954), *Brit. dent. J.*, **96**, 76.

A NEW METHOD FOR MEASURING TOOTH MOBILITY*

By A. A. JOEL, B.Sc., B.D.S. (N.Z.)

I APPRECIATE the opportunity of presenting this paper to you and trust that it will not prove entirely without interest. The aim is to present the principles of this new method and to show that it can achieve considerable accuracy. Much remains to be done, but at least I feel we will be working on sounder ground than in the past.

It is barely necessary with such an audience to point out why such measurements are desirable; certainly, accurate measurements are invaluable to periodontology as well as to other branches of dentistry such as orthodontics. Suffice it then to quote Miller (1950), who says: "The most primitive recommendation, yet the only one found in current textbooks of Periodontia, is to move the tooth between forefinger and thumb" (and to judge the amount of movement by eye)—the parentheses are mine.

Perhaps a brief survey of previous efforts in the field would be appropriate, as it indicates the pitfalls of the past and the reasons for attempting to change the approach to the subject.

a. In 1939 Elbrecht measured movements of not less than 0·75 mm., but he was unable to allow for head movement as he used an extraorally placed dial indicator. At least this was a start, but by later standards it can only be regarded as a slight improvement on judging the movement by eye.

b. In 1942 Werner took measurements using a vibration method which could measure movements relative to adjoining teeth (which seriously limits its value) and he could measure movements of not less than 0·25 mm.

c. Between 1949 and 1952 Zwirner used an electronic method, but apparently the results were inconclusive. In any case, the apparatus was expensive and the idea does not seem to have been proceeded with.

d. The above survey is culled from an article by Muhlemann (1954), who appears to be the most successful worker in this field up to date. He it was, I believe, who gave this field of endeavour the imposing name of "periodontometry". Certainly it trips off the tongue and at least I may be making some contribution to periodontology by not suggesting another name. I often feel that periodontologists can be defined as dentists who feel it their duty to call the same set of clinical conditions by a different set of names.

Muhlemann, then, was able to measure the linear movement of the incisal edge of the tooth when the movement was not greater than 0·02 mm.

Muhlemann has described his method in detail, but briefly one can say that a rod is placed a known distance from the incisal edge of a tooth. This rod is connected by a spring mechanism to a dial indicator which is anchored inside the mouth by being attached to a firm molar tooth with a rubber dam clamp. Consequently, the pointer on the dial indicator shows the linear movement of the rod and hence the linear movement of the tooth at that point. Moreover, such a measurement avoids any error due to head movement. The disadvantages of this method are:—

1. The expense of the dial indicator—to measure such minute movements involves the use of very delicate and hence expensive spring mechanism.

2. The method merely measures linear movement. The point here is made obvious if we consider two hypothetical teeth, say, an upper canine and a lower incisor. If we assume that the canine crown is three times as long as that of the lower incisor then the same amount of linear movement at the incisal edge of the teeth represents entirely different clinical conditions. Obviously the incisor tooth is in much worse condition than the canine. Also, of course, the axis of rotation must alter as the health of a given tooth's supporting structures. Admittedly for any given tooth one can use

* A short communication given at the meeting of the British Society of Periodontology, held on March 10, 1958.

linear movement and accurately plot the reduction of movement as treatment proceeds. However, if one wishes to be able to compare different teeth then one must use a *radial measurement* showing the number of degrees or minutes through which the tooth has moved about its fulcrum.

PRESENT METHOD

The method differs from Muhlemann's dial indicator method in the following ways:—

a. It costs nothing at all.

b. It measures the *radial movement* of the tooth.

c. The movement is greatly magnified.

Fig. 1.—Showing mirrors and prism in position in the mouth.

d. A means of ensuring that head movement does not affect the result is employed. (This is not required in Muhlemann's method.)

Put briefly, one shines a light on a mirror attached to the tooth and the tooth movement is shown by the reflected image on the opposite wall or any suitable surface. Another mirror is attached to a tooth some distance away and if this reflected image stays still then the measurement is an accurate one since this mirror is used to check any head movement. The source of light used was a Rathbone spotlight. The mirrors were mounted with plasticine on a guttapercha block stuck to the tooth. This allowed the mirrors to be quickly and simply adjusted. Originally I used small pieces of mirror obtained by breaking an old mouth mirror, but in the illustration (*Fig.* 1) is shown a circular surface reflecting mirror and a prism as these look a little more civilized, but they are, of course, too large. The prism, placed occlusally, may well be helpful for posterior teeth. I am quite sure that tiny mirrors of a few millimetres in size can be obtained readily and cheaply. To move the teeth I simply cut a V-notch in a cement spatula and pushed and pulled the teeth with this. I did not use any special instrument to show the number of grammes of force being used since Muhlemann has shown that such an instrument does not help to achieve more accurate results.

The principle I have outlined is simply an adaptation of the well-recognized method of measuring very small electrical currents. For such purposes a swinging galvanometer is used in which a mirror, with a light source playing on it, replaces the pointer and so the movment can be magnified many hundreds of times. To assess roughly the degree of magnification achieved in my surgery I set two teeth in plaster and had one tooth movable approximately 3 mm. at the incisal edge. This produced a movement of the reflected image of over 300 mm. so that the movement was magnified at least 100 times.

Fig. 2 shows how the angle of movement was calculated. The set-up was arranged to keep both the mathematics and the optics uncomplicated, and to achieve this I feel it desirable to have the reflected image returned close to the light source when the tooth is at rest. Now in the arrangement used, 10 in. of movement of the reflected image represented 380 min. of movement of the tooth. Using a tooth with a very small amount of movement, i.e., very nearly normal, I calculated that a tooth with 38 min. of movement would have a linear movement at the incisal edge of the order of 0·05 mm. This is only a rough approximation designed to relate this new concept of radial movement to the old linear movement so that some idea of the degree of accuracy can be gauged.

Finally, I should like to present some recordings (*Fig.* 3 A, B) which show exactly what happens so far as the reflected image is concerned. In a darkened room the reflected images were positioned over a box containing

photographic printing paper. When the box was opened the movement of the reflected image was recorded. There can be no dispute that the amount of head movement is very small and in any case can be accurately measured if this photographic method be used. It is interesting to note that a combination of buccolingual and mesiodistal movement was shown by the curved path of the movable mirror. Close inspection of the tooth satisfied me that the tooth in question did in fact rotate around two axes. This appeared to be due to interference by neighbouring teeth. These tracings are the first attempts I have made and could be improved upon, but it is worth noting that they were carried out from start to finish in less than 5 min. for each individual recording.

Problems.—

1. *Keeping the Head Still.*—This is the greatest problem and not until I took photographic recordings did I feel sure that the head could be kept still. The only aids I used were to have the patient bite on a hardened composition squash bite and to ask him to close his eyes. This latter procedure was helpful as it prevented the patient from making a conscious effort which always seemed, strangely enough, to produce movement.

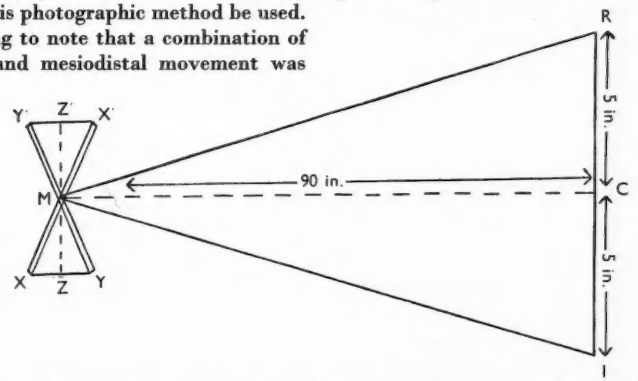


Fig. 2.—C, Reflected image at rest (the light source should be very near to this point); M, Centre of mirror placed on tooth; X′Z′Y′, Top of mirror (or incisal edge of tooth) in its various positions; XZY, Bottom of mirror in its various positions as the tooth is rotated. By trigonometry it is simple to calculate the angle RMI which is the angle of tooth movement.

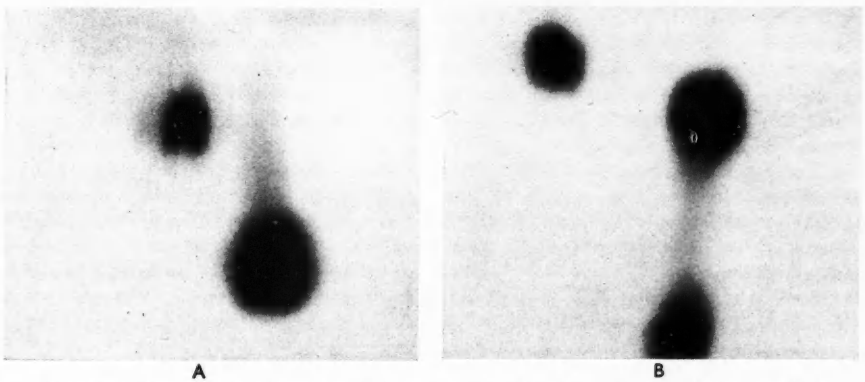


Fig. 3.—A, Mirrors at rest; B, Tracing of mirror movement using the same teeth and mirrors as in A. The tooth movement is almost negligible (shown by mirror image on the left). The tooth movement, shown by the longer image on the right, moved nearly 6 inches or 3°48″ of radial movement.

2. *Damping down the Light in the Surgery.*—It is not practicable to black out completely all surgeries, but in all cases it should be possible to cut out direct sunlight. To magnify the reading well, one needs to have a good distance from the patient to the surface on which the reflected image shows. Since light intensity varies directly as to the degree of blacking out of the surgery and is inversely proportional to the square of the distance, then it is obvious one needs the surgery as dark as possible. I imagine that if one could use a large ground-glass screen as is used with a swinging galvanometer then one might manage without having to close out too much light.

May I conclude then by suggesting that this method of measuring tooth mobility can be accepted as being accurate, simple to apply, inexpensive, and capable of perfect reproduction if one can fully darken a surgery. It remains to be seen how simple it can be made for a surgery where the intensity of light can be only slightly reduced. I feel confident that aiming at measuring a magnified *radial movement* is sounder than trying to measure directly a minute *linear movement.*

REFERENCES

MILLER, S. C. (1950), *Textbook of Periodontia*, 3rd ed. New York: Blakiston.

MUHLEMANN, H. R. (1954), *J. Periodont.*, **25**, 22.

BOOK REVIEWS

A MANUAL OF ORTHODONTICS. By HALLAM GRESHAM, D.D.S. (N.Z.), Senior Lecturer and Head of Orthodontic Department, University of Otago Dental School, Dunedin, New Zealand. With a Foreword by Professor J. P. WALSH, M.B., B.S., D.D.Sc., L.D.S., F.D.S. R.C.S., Dean and Director, University of Otago Dental School. $8\frac{1}{2}\times5\frac{1}{2}$ in. Pp. 196+xii, with 127 illustrations. 1957. Christchurch, New Zealand: Peryer Ltd. 57s. 6d.

IN his preface the author states that "this book must be looked upon as an introduction to the subject, a view of orthodontics from the standpoint of the General Practitioner". How far does he succeed?

The first portion deals with growth and development. There, due emphasis is given to variations of the normal. The author feels that function plays an important part in the development of the jaws, but one should point out that this is not widely accepted. A considerable number of references have been quoted, and in such a short work as this, their value cannot be properly discussed. The result is a rather jerky chapter which does not leave one with a clear picture of the developing jaws.

In the chapters dealing with aetiology and diagnosis very little emphasis is placed on the orofacial musculature. This is unfortunate, because without a proper appreciation of the part played by the lips and tongue in producing or maintaining a malocclusion, many orthodontic treatment plans are doomed to failure.

When dealing with treatment, the author has been more direct in his approach; and, though one does not agree with all he has said, it is felt that in a book of this size less confusion will be caused by this method than by discussing possible alternatives.

One is left with a general impression that too many views have been condensed into too small a space. Apart from the chapters on treatment, the Practitioner reading this book may well find himself more confused than when he started. But treatment without an understanding of growth, development, and the aetiology of malocclusion is not to be recommended. J. S. R.

THE ALEUT DENTITION. A Correlative Study of Dental Characteristics in an Eskimoid People. By COENRAAD F. A. MOORREES. $9\frac{1}{2}\times6\frac{1}{4}$ in. Pp. 196+x, with 29 illustrations. 1957. Cambridge, Mass.: Harvard University Press (London: Oxford University Press). 36s.

A FIELD survey of the dentitions of only 156 individuals would not generally be considered sufficient justification for a book. However, Dr. Moorrees has shown that numbers are by

no means an essential prerequisite for the production of a book which will be of value to anthropologists and odontologists alike. Dr. Moorrees gives an adequate description of the historical and social background of the Aleuts and then discusses the morphological characteristics of the teeth. As is to be expected in a work of this kind, the description of the morphology and the odontometric study occupy half the pages. The other half of the book covers a diversity of subjects such as Torus mandibularis, gingival pigmentation, dates of eruption of the teeth and their subsequent occlusion. Periodontal disease was virtually non-existent in this population, but dental caries was present. Caries incidence has increased in recent years, and the author has some interesting views on the changes in caries resistance of their teeth in the last half-century. The value of this book is enhanced by the full list of references. T. G. H. D.

CLINICAL APPLICATIONS OF HYPNOSIS IN DENTISTRY. By S. IRWIN SHAW, D.M.D., M.Ed. 8×5 in. Pp. 173+xii, with 25 illustrations. 1958. Philadelphia and London: W. B. Saunders Co. 31s. 6d.

THIS is an excellent presentation of the fundamental techniques of hypnosis with verbatim application as practised by the author.

Dr. Shaw does emphasize in the preface that it is a manual of practical application for those using hypnosis, and, for the beginner, a working outline for routine procedures. This it achieves. The subject is now facing a modern revival; it is controversial and has a history of struggle against bad repute. Dr. Shaw shows his sincerity for the controlled use of hypnosis to better the profession, aid the patient, and elevate the subject. Because of this the book is a useful adjunct to the student attending a course on the practice of hypnosis.

The book is written in three sections—procedure, an appendix on an introduction to human behaviour, and case reports on the application of hypnosis. There is a short bibliography suggesting further reading for the dental surgeon who desires a more complete coverage of hypnosis.

It is questionable whether the author's chatty writing has not tended to oversimplify the procedures and introduce a certain amount of New World verbosity that might deter some patients in this country during certain phases of the treatment. The reader will certainly find some things alien, and yet he will be awakened to the fact that he has been applying relaxation techniques all his professional life. The book will appeal to all sections of the profession, both as an introduction for the beginner and to the practising hypnodontist.

J. L. M.

DENTAL CLINICS OF NORTH AMERICA (March 1958 issue): Symposium on Practical Oral Therapeutics. Consulting Editor: F. DARL OSTRANDER, D.D.S., M.S., Professor of Dentistry, University of Michigan School of Dentistry. $8\frac{3}{4}\times5\frac{3}{4}$ in. Pp. 276+x. 1958. Philadelphia and London: W. B. Saunders Co. Published three times a year. Subscription 98s. per annum.

THIS is the first of the three volumes to be issued this year in the *Dental Clinics of North America* series. It follows the pattern as before: a collection of articles by a number of American authorities on some aspect of dentistry.

Practical Oral Therapeutics is a timely volume which does much to explain the present position of the host of remedies that have been developed in the past two decades. Most of the drugs used in hospital medicine and dentistry to-day were unheard of before the last war. Consequently, most practitioners are justifiably ignorant concerning them. Startling reports are read in the lay press about such things as tranquillizers, the antihistamines, adrenal cortical hormones, and therapeutic dentifrices. Our patients frequently embarrass us by questions concerning their relation to dentistry. After reading this book no one should still be at a loss.

Not only does it cover these drugs but also pre-operative medication, the aetiology and nature of pain, the newer local and general anæsthetics, topical and systemic antibiotic therapy, drugs in heart disease, periodontics, root-canal therapy, and in cavity medication.

There are also chapters on other aspects of dental therapeutics.

The twenty-seven authors of this symposium have been at pains to produce a most readable text, which cannot be praised enough for its conservative approach. We in Britain are often critical of the American over-enthusiasm for new drugs, but here we have a very careful appraisal of these revolutionary treatments and in most cases are warned against accepting their use in routine practice at present.

One cannot but agree with such a remark as that of Stanley Harris, who says that the tranquillizing drugs often cause "sedation and depression, that they are allergenic and sometimes quite toxic, and that the psychological impact may be unfavourable. All are good reasons for dentistry to delay acceptance of these drugs for allaying dental apprehension."

Elsewhere Holmes Knighton says "antibiotics cannot be substituted for good oral surgery and the routine use of topical antibiotics in post-extraction wounds is not indicated, while their use in root-canals should be limited to selected cases." However, not all the authors are so damning. These two quotations serve to show the commendable reserve with which they treat certain recent discoveries used in dental practice.

This volume, as with its predecessor, can be highly recommended to the general practitioner, but is perhaps too superficial for the specialist, and certainly not broad enough in coverage for the dental student. D. D. D.

OBITUARY NOTICE

J. FORBES WEBSTER,
F.R.F.P.S.G., F.D.S. (Edin.)

MANY dentists in Scotland will regret the passing on May 5 of John Forbes Webster, who was born in 1879 and qualified L.D.S. Glasgow in 1901 and L.R.C.P. and S. in 1903. In 1915 he was admitted a Fellow of the Royal Faculty of Physicians and Surgeons of Glasgow, served several terms of office on its Council, and was an examiner for its diplomas, L.D.S. and H.D.D. In 1951 the Royal College of Surgeons of Edinburgh granted him a Fellowship in Dental Surgery without examination.

In 1902 he became a member of the staff of the Glasgow Dental Hospital and School, and twenty-three years later was appointed part-time Dean. His most notable work was in connexion with this Institution. For long he appreciated the total inadequacy of the premises and was convinced that a new building should be erected and equipped. This was formally opened on May 31, 1932, and is a striking tribute to his foresight and impetus.

In 1936 he was appointed full-time Dean, and resigned in 1947, after having concluded the negotiations for the Dental School becoming part of the Faculty of Medicine of the University.

Throughout his long association with the Glasgow Dental Hospital and School, he displayed exceptional ability and judgement. That he was a sound pathologist and bacteriologist and a most capable oral surgeon were but a few of his many attributes.

As an administrator he was always unassuming and constantly fair and helpful to all. He could, on occasions, appear slightly brusque to those who neglected duties or expected him to pass slipshod work.

He realized the danger of the practice of dentistry developing into a technical craft. Consequently, it is not surprising that, in 1902, he was one of the founder-members of the Glasgow Odontological Society, aimed at developing the scientific aspect of our profession.

It is a privilege and a pleasure to pay a personal tribute to a colleague. Twenty-two years ago, the writer absorbed Forbes Webster's practice into his own. In all negotiations he exercised a high sense of probity, besides being consistently helpful. It is sometimes remarked that when one acquires another's practice, friendship ceases. Such was assuredly not so in this case. In fact, the outcome was that the writer learned to appreciate Webster's sterling qualities in a very real sense. In consequence, the friendship was consolidated and remained unbroken.

J. MENZIES CAMPBELL.